Electrical World

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Smooth Out the Business Load Factor

MOB psychology and gambling should have little influence on the course of business in this country. Yet the recent stock market crash apparently caused some concern because it aroused fear that there would be a public reaction that would affect buying. As a consequence we have had a series of conferences called by President Hoover to reassure the country. Undoubtedly these conferences have had considerable influence upon the mass mind and have caused business men to go forward with their plans without hesitancy.

It is encouraging to note that many executives in the electrical industry have issued courageous statements about business. The light and power branch of the industry expects to spend about $850,000,000 in 1930, and the electrical manufacturers anticipate a volume of sales equal to that of 1929. There is nothing wrong with business, but a "fear" or "caution" complex could become contagious.

Of all industries the electrical should do its utmost to retain an economic balance in production and consumption. Electric service and electrical products are used so freely that a generally prevalent prosperity is a desirable industrial condition. The present year has been above normal for all branches of the electrical industry, and the marginal sums thus acquired should be invested to develop more business. It is a time for added sales efforts and for the expansion of service facilities. The business is available, and it is the part of wisdom to spend incomes to improve the valley load conditions. It is the time to make business better, not worse.

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Restrict Federal Encroachments on State Authority

THE proposal that federal authority should regulate electric power transmitted in interstate commerce is a recent symptom of the gradual extension of the federal field of operation never dreamed of by the founders of the Republic. As pointed out by Governor Conley of West Virginia in this issue, boards, bureaus and commissions, with broad authorities conferred and constantly acquired, have been created to regulate and control the activity of the citizen until a large percentage of the adult population is on the public payroll. This creates bureaucracy and causes stagnation in initiative. It puts a political tool in the hands of politicians and takes no account of variations in state conditions. Such a policy should be condemned.

As for federal regulation of electric power, actual knowledge of conditions shows it to be both unnecessary and unwise. The whole trend in electric power generation is to restrict the transmission distance. Both continuity of service and economy in operation force local generation for local loads. And as load density increases in all sections there will be a still greater tendency toward restricting the transmission distance. Even now only a small percentage of electrical energy is interstate, yet proposals such as those embodied in the Couzens bill are introduced in Congress to place a most cumbersome and unnecessary federal regulatory body in a position to dominate the regulatory control of the state commissions. Both policy in government and the facts about electric power generation condemn any attempt to bring about federal regulation of utility service and rates.

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Sound Sense from a Government Bureau

THE Federal Power Commission in its annual report sheds light on subjects which affect water-power development and indicates that the commission is alive to the economic, meteorological and geographical handicaps which must be overcome if greater hydro-electric developments are to come in the future. In this respect this year's report is notable. The commission is not blind to the great advance made in the production of electricity from steam nor to its competitive significance. Nor is the commission unmindful of the lack of constructive public co-operation on questions of policy and law governing water conservation. All of these topics are treated calmly, dispassionately and understandingly.

One topic, however, is handled with refreshing frankness for a bureau which might have aspirations in the opposite direction, and that is regulation. The federal water-power law is not so old that the commission forgets the manner or circumstance of its enactment. "Very wisely," it says, "Congress by the act subor-

dinated the regulatory powers of the commission to the jurisdiction exercised by the several states." Would that some members of Congress had as good a memory! "It seems clear, therefore," says the commission, "that Congress thought of the control of electrical utilities as a local problem and that the imposition of a superior authority would be needed only in the event of disputes between states."

Of course, it may be that in making so sensible an observation and deduction from the facts the Federal Power Commission assumes too much; but we doubt very much whether any such criticism will be voiced outside the halls of Congress. It certainly stands four-square with the facts, and the commission is to be commended for thus epitomizing the thoughts and actions of the Congress which brought the act into being.

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Seattle and Tacoma Municipal Plants Pray for Rain

FOR the second time in less than a year the Pacific Northwest has been hit by a water shortage, seriously curtailing the output of hydro-electric plants. Last winter it was caused by an abnormal cold spell. This time it is due to a protracted drought. Output from Tacoma's hydro plants is pitiably small and city officials were forced to announce that power would be rationed to customers within the city limits beginning this week and that all customers outside the city limits would be cut off at once. Seattle's Skagit and Cedar River plants likewise are operating at reduced capacity, but the 30,000-kw. Lake Union steam plant, which is carrying a 10,000-kw. overload continuously, has so far saved the day for the Seattle municipal system.

So alarming has the situation become that the cities of Tacoma and Seattle have asked the navy for use of the electrically driven airplane carrier *Lexington* to be anchored at Tacoma to feed into the municipal system through step-up transformers. The Puget Sound Power & Light Company, serving western Washington, experienced a power shortage a year ago and built a 40,000-kw. steam plant, giving it 72,000 kw. of steam capacity to care for just such emergency.

Several times during the past five years various sections of the Pacific Coast have suffered a water shortage which has affected private and municipal systems alike. The difference between private and municipal ownership is that the private utilities immediately took steps to supplement their hydro plants with sufficient additional steam to meet another threatened shortage, whereas the cities continue to add hydro capacity and trust to good fortune that water will henceforth be available to operate the plants. The result has been that no private utility has been hit twice.

What Seattle and Tacoma will do in their present dilemma they themselves do not know. With approaching winter, the precipitation in watersheds is likely to be snow, causing limited runoff and still further reducing plant output. Little relief is in sight and prospects are not bright. The best they can do is to hope and pray for early warm rains. The lesson that should be learned and applied is that water power must be supplemented with fuel power if service is to be rendered at all times.

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The Foreign Market Offers a Solution

THE value of the foreign market as a business stabilizer was emphasized at the conference of industry leaders in Washington last week. Promotion of exports at this time will react favorably upon employment, and hence upon buying power, since exports constitute so important a part of the nation's total business. But to promote a foreign business during periods of depression in this country, or in anticipation of such periods, and then to drop the effort is a near-sighted policy and a losing game. American industry showed a disposition to do just this thing after the depression of 1921. It has not yet lived down the pernicious effects of that policy. Exports should be planned on the basis of developing and maintaining new lines of activities and not on dumping surplus.

Whether or not the electrical equipment industry is guilty of a similar practice, it is evident that foreign business could be promoted at this time to advantage. In 1920 that industry exported $113,000,000 worth of equipment. The total, however, fell off sharply as business improved. In 1922 it was only $58,000,000. Since that time it has shown an annual increase, but there is little evidence of aggressive promotion and careful development except by the few. The present offers a singularly attractive opportunity for intensive development of electrical business in South America and elsewhere. In this way the industry not only will benefit itself but will help to keep American labor at work and business on an even keel.

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No More Choke Coils

FOR many years the choke coil was considered a necessary and venerable means for protecting a station against lightning. Installing a lightning arrester without choke coils was considered heretical and foolhardy. Many pages of theory were written about the most efficient shape of the choke coil. There were spiral coils, cylindrical coils and hourglass coils, coils on post insulators and strain coils, open coils and coils with end protections against birds' nests. There was even some discussion about the advantages and disadvantages of vertically mounted as against horizontally mounted coils.

A little over a year ago it was suggested in an editorial in the ELECTRICAL WORLD that recent tests

made the usefulness of the coil somewhat less certain than was taken for granted by every one, and it was suggested that further investigations should be made. And now the result of a thorough investigation, of which an account was published in the ELECTRICAL WORLD of October 12, proves conclusively that the choke coil at its best is of questionable utility and at its worst quite harmful. One very prominent manufacturing company has announced that it has abanboned the production of choke coils and does not recommend their use. What a disillusionment to all those who considered the choke coil as almost sacred! How many more such frills are there in the electrical industry, remnants of the pre-research days, that have been carried along as a matter of course without any one stopping to raise the questions: "What are they for?" "Do they do any good?" "Perhaps they do some harm?"

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Impressions of New England Industrial Conditions

RECENTLY a party of McGraw-Hill editors visited New England to get a first-hand impression of industrial and economic conditions. They visited numerous factories and discussed business affairs with leaders in forty communities. They found New England wide awake and busy. The work of the New England Council is being augmented by state organizations to maintain the industrial position that made this region successful in the past.

The industrial advantages of New England lie in its supply of skilled labor, an experienced group of manufacturing executives, a diversified type of manufacturing, a splendid electric power supply and a very large local market for manufactured products. As is the case with other regions in this country, New England is readjusting itself to the present economic situation in regard to manufacturing. The mass-production, mass-consumption type of manufacturing, in which the value added to the product by manufacture is small, must be based in volume on the demands of the regional market. Freight rates and quick deliveries make it difficult to meet competition in this type of industry by any method except the establishment of branch production plants in each market area. A second readjustment is the development of highly specialized manufacture, of the type that adds greatly to the value of product, for the supply of national and even international markets. Thus, in brief, New England is adjusting itself to the decentralization trend in mass-production manufacturing and at the same time is developing the highly specialized type. All this will take time, but there is leadership and the will to do.

Negative impressions are minor in comparison with the general impression, but they should be stated. There should be a greater degree of co-operation between cities and between states for the upbuilding of the region under the leadership of the New England Council. There should be a positive program for the elimination of old factory buildings, old machines and processes and uneconomical manufacturing methods. In many older plants daylight and artificial light are deplorable; little attempt is made at ventilation in crowded, low-ceilinged workrooms, and the general sanitary conditions and physical surroundings in many instances are not conducive to good working conditions. There is opportunity for modernization in production methods and processes, and the electrical industry has an enormous business in prospect in lighting, motors and control. All these things are understandable, but the rate of industrial progress in New England will be fixed quite accurately by the rate at which these conditions are improved.

The basic assets of New England are unchanged and are even enlarged, and the thoughtful leaders of the section are fully aware of the merits and demerits of the industrial situation. Plans for improvement are made that will be applied on a co-operative basis, and it is encouraging to find that utility executives are taking a leading part in this work. New England industry is on the up grade, because its sturdy states possess men of knowledge of how to do and the will to do.

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Standard for Comparing Lightning Arresters

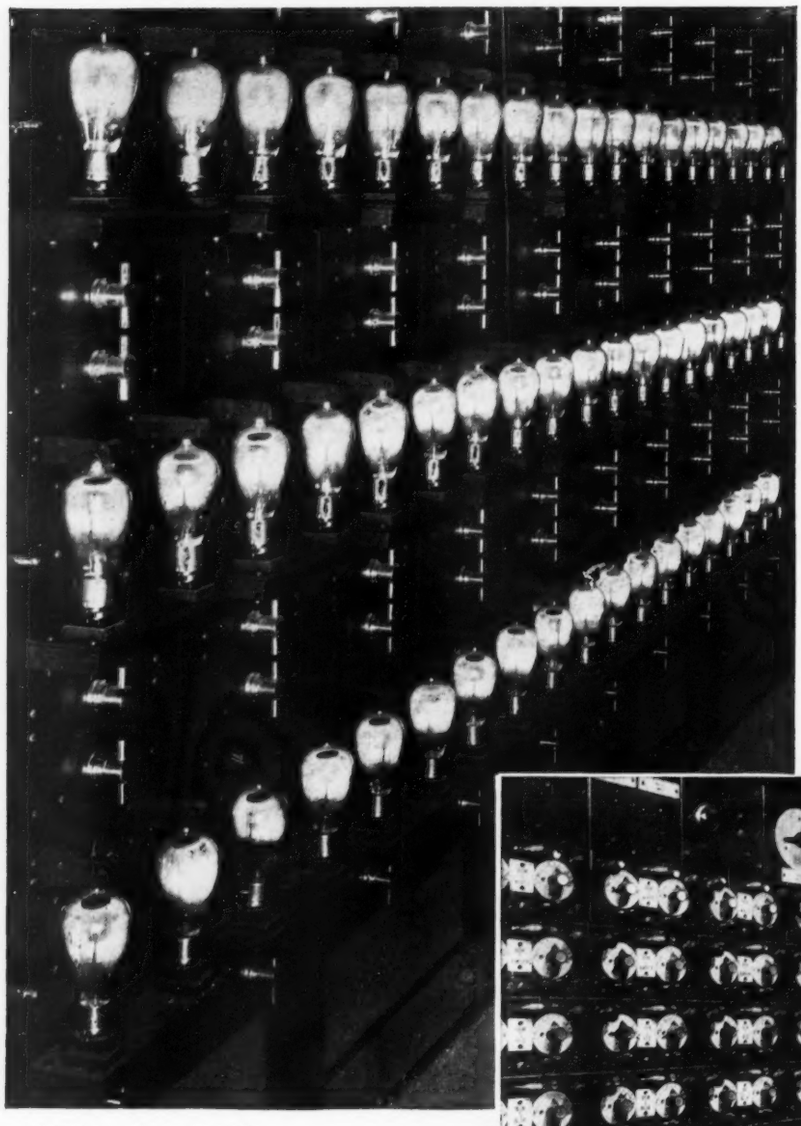
UTILITIES have invested enormous sums of money in lightning arresters in the hope that voltage surges may be drained to ground before they damage terminal equipment and thus curtail service facilities. Many of these companies frankly admit that they have no proof that lightning arresters perform the function for which they are intended, but they are unwilling to hazard service by omitting such protective apparatus. Lack of knowledge regarding surges and apparatus to measure performance have retarded the elimination of this uncertainty, but a stage has been reached where some more definite basis for comparing lightning-arrester performance should be forthcoming promptly.

Right now, if an engineer is faced with purchasing lightning arresters, one manufacturer's representative will show the performance of his arrester under one set of conditions, while another manufacturer's salesman will show characteristics based on entirely different conditions. There is no basis for intelligent selection.

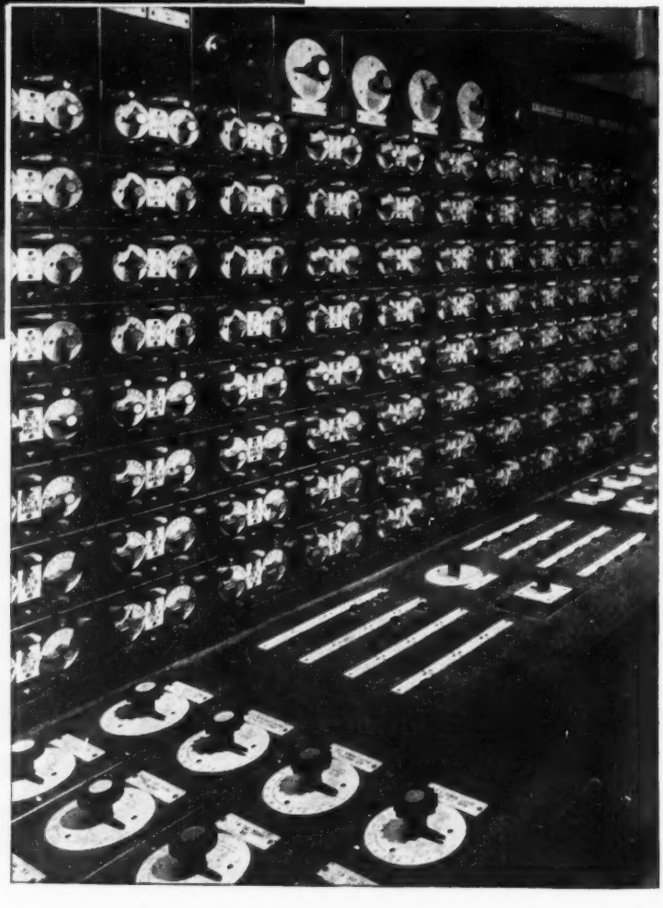
Rather than wait for the ideal method of rating arresters, they should be rated for the time being on the most severe wave-front and surge duration shown to exist by recent cathode-ray oscillographs of lightning. Possibly it may be necessary to adopt two standards of surge waves as a basis. If manufacturers will select the same basis for rating, users of equipment will, at least, have some basis for judging which units will serve their requirements. Unless special tests are made they have now to choose blindly.

The Vacuum Tube in a New Rôle

THE vacuum tube is continually being applied to novel uses. One of the latest is the control of lighting in the new Civic Opera House of Chicago. This equipment permits concentration of control in front of the stage, if desired, where the operator can better judge the lighting effects.



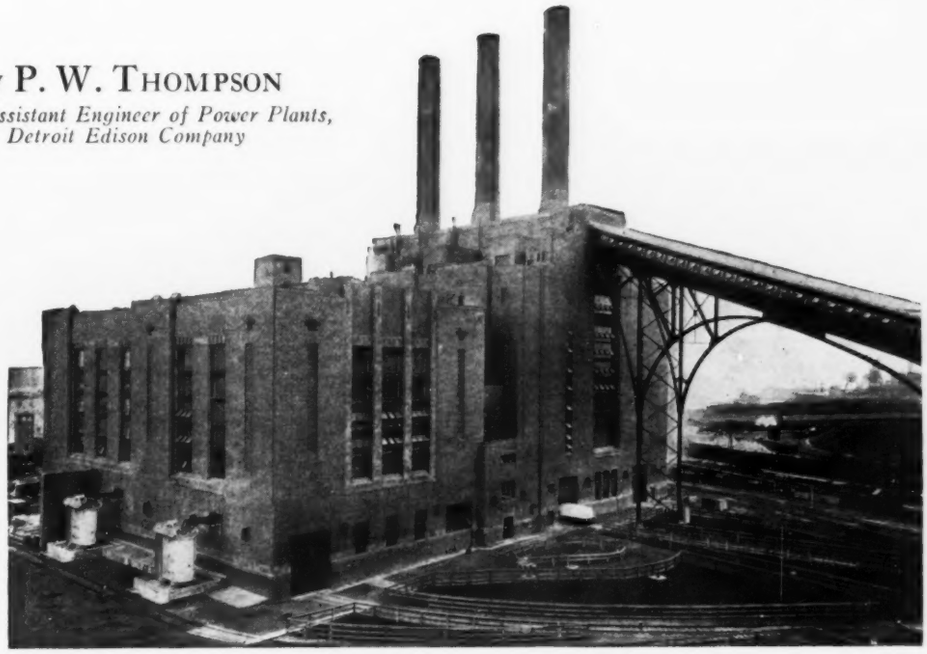
Portion of a Board Supporting 104 Tubes that Are Controlled from the Panels Below.



The grid circuits of the tubes, which are of the screen-grid type, constitute the controls. The plate energy, thus controlled, passes through magnetizing windings on iron-core reactors in series with the alternating-current lighting circuits. The variations in the reactor core flux change the reactor inductances and thus control the alternating currents through them.

New Stations vs. Rebuilding

By P. W. THOMPSON
Chief Assistant Engineer of Power Plants, Detroit Edison Company



Factors that influenced decision to build Delray No. 3 on site of existing station rather than locate it elsewhere or to increase system capacity by rebuilding or adding to plants in service

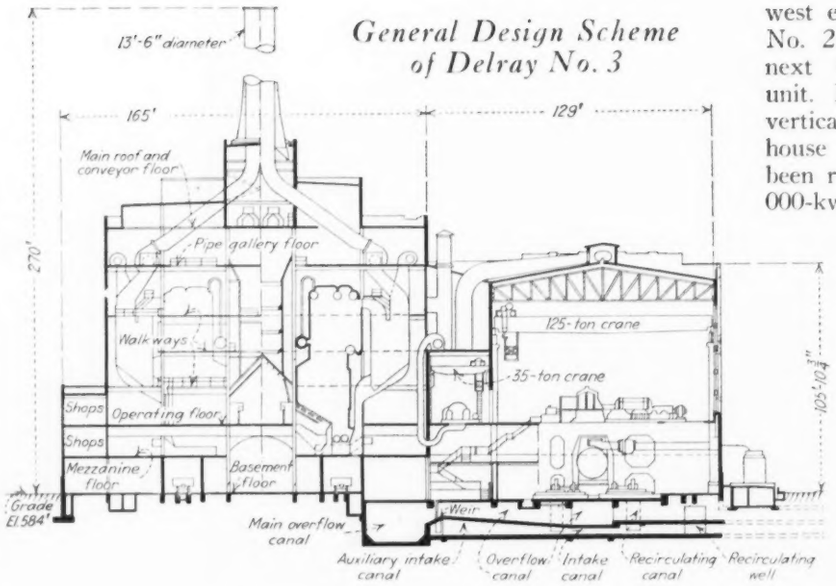
IT IS axiomatic in central-station operation that system capacities must be installed and ready for the loads when they come. A totaling up of existing and expected loads, together with a consideration of their locations, on the system of the Detroit Edison Company indicated as far back as 1925 that in 1929 or 1930 the then planned additions to generating capacity would be insufficient. That is to say, there would be required in the five years from 1925 added capacity over and above that which, if installed in existing but uncompleted stations, would bring them to the limit of their designed ultimate ratings. Furthermore, a certain loss of generating capacity was easily predictable on account of the age of the steam-generating equipment in the oldest plant in the system, Delray power house No. 1.

A study of the power areas in the system showed that the district which could well be served from the Delray site was then being partly supplied from more remotely located generating stations. It might be well to point out here that in the Detroit Edison Company's scheme of operation each generating station supplies all the energy to a definite load area and that the generating stations are customarily interconnected with one another through electrical ties of only sufficient capacity to permit of flexible operation of the generating equipment. Predictions of load increases and their locations indicated that the district relatively near to the Delray site would show a greater proportional load increase than the remainder of the system. As a location for the additional generating capacity which would be needed in the fall of 1929, no other available site presented any advantages over the site already occupied in part by Delray power houses Nos. 1 and 2. A study was therefore made to determine how this additional capacity requirement might best be met.

Because the turbine buildings of power houses Nos. 1 and 2 occupied practically the entire width of the property, any longitudinal extensions of the present turbine buildings for the purpose of accommodating additional generating capacity were not considered feasible. This is apparent from inspection of the accompanying plan of the Delray property. There remained, therefore, two methods by which this increase in capacity could be obtained. The old vertical turbo-generators could be replaced with modern equipment, giving a much greater capacity per unit of floor space occupied, or an entirely new station could be built directly south of power house No. 2, between it and the Detroit River. The space there available was sufficient for an installation of at least 350,000 kw.

Consideration was first given to rebuilding the old power houses, replacing the vertical turbo-generators with horizontal units of much greater size. In order to visualize the situation as it existed, a brief description of the old power houses Nos. 1 and 2 is given. Power house No. 1 first went into operation in 1904 and was rearranged in 1910-12. At the time of this study it contained 24 520-hp. boilers and four 9,000-kw. vertical

turbo-generators. The foundations were originally of the spread footing type, later reconstructed to form a nearly continuous solid concrete mat. Power house No. 2 commenced operation in 1909 and at this time contained eleven boilers totaling 23,650 boiler-horsepower and five turbo-generators. Four of these machines are vertical and total 57,000 kw.; the other, a 30,000-kw. horizontal unit which was installed in an extension at the west end of the turbine room in 1920. Additional steam-generating capacity was obtained at that time by adding two boilers in the existing boiler room and equipping three with economizers.



General Design Scheme of Delray No. 3

Both power houses utilized steam at 200 lb. pressure and a temperature of about 550 deg. F. The voltage of all generators except the 30,000-kw. unit was 4,800. This one unit generated at 12,000 volts and delivered its output through an auto-transformer at 24,000 to the Waterman switch house, located at the extreme north end of the property. This switch house was built in 1920 and was so constructed that it could be added to as required when and if additional generating capacity should be provided, either in the old power houses or in a new power house on the Delray site.

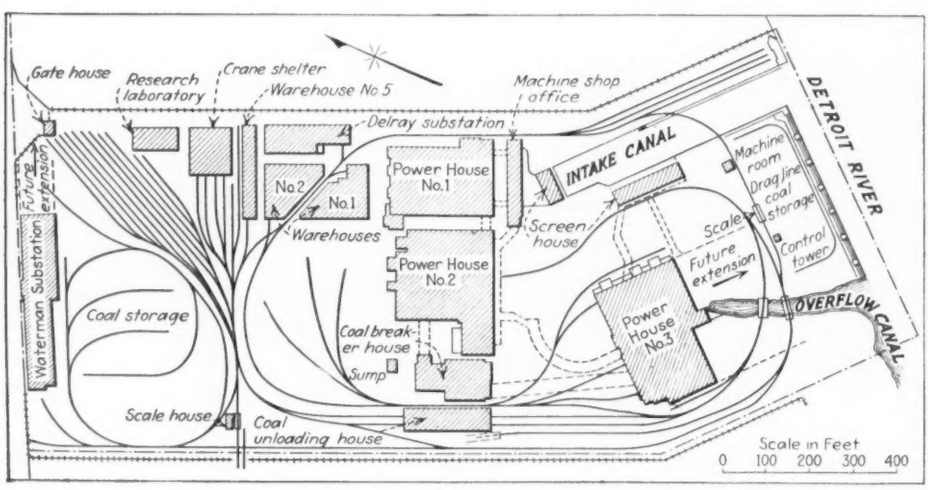
In considering the possibility of obtaining the required increase in capacity by replacing vertical units in the old power houses, several possible arrangements of 50,000-kw. units were studied. The limitations imposed by the existing width of turbine rooms and arrangement of canals indicated that the most favorable was that in which these new units were placed with their axes in line and arranged lengthwise of the turbine room, starting at the west end of power house No. 2 turbine room and next to the 30,000-kw. unit. In this way the four vertical units in power house No. 2 could have been replaced by two 50,000-kw. units. By utilizing the space between the two power houses two additional 50,000-kw. units could later be placed in power house No. 1. The space limitations, however, in the present turbine buildings would have resulted in a rather cramped arrangement of piping and equipment.

The foundations, although suitable for the present equipment, would not have been entirely satisfactory for the new and heavier machines. The present foundations are of the boat type, consisting of a concrete mat approximately 3 ft. in thickness with some reinforcing. This mat is capable of supporting a concentrated load over a comparatively small area—the resulting soil pressure being in the neighborhood of 2,000 lb. per square foot loading. Only minor settlements have resulted from this. When it came to the study of replacing these vertical machines with horizontals, it was found that the total deadweight over the same area would be very nearly doubled, and this caused some concern as to just how the clay would react to this condition. Another difficult problem was that of the main crane. The existing crane was of 60-ton capacity and in order to provide for a 50,000-kw. unit a 125-ton crane would be required. This, in addition to the necessity of replacing the crane girders and columns, presented a difficult problem in spreading this concentrated load over the clay subsoil.

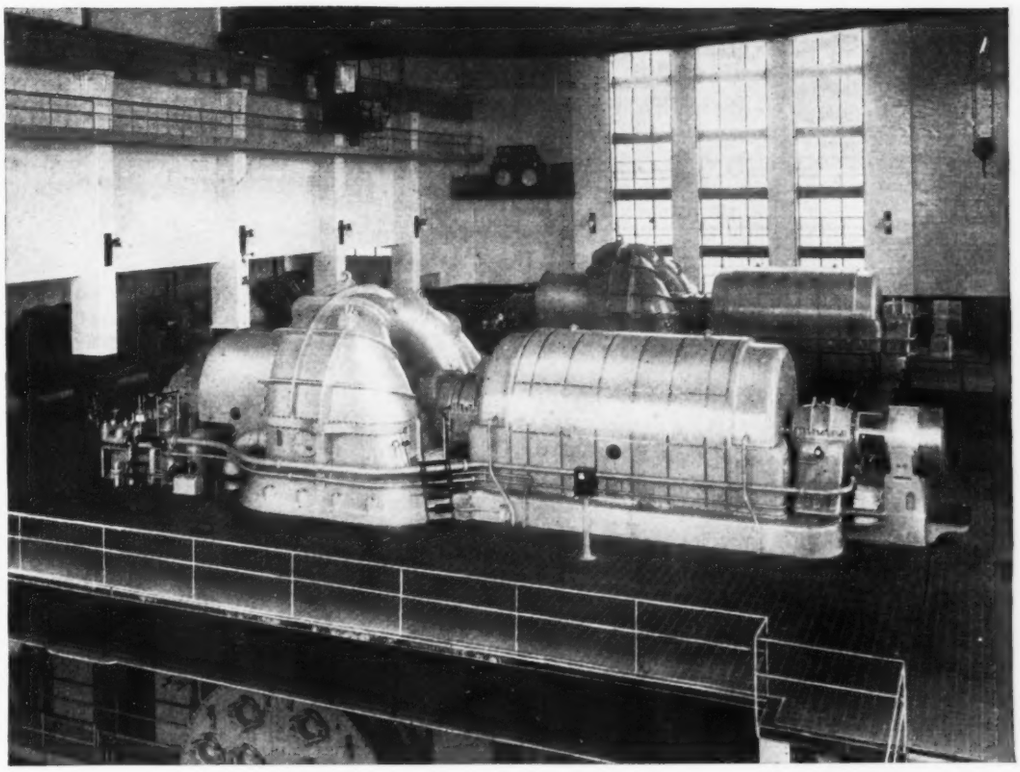
Although the boilers in power house No. 1 had about reached the limit of their useful life, the boilers in power house No. 2 were considered to be good for at least ten more years of service. In order, therefore, to save these boilers the steam pressure for the new machines would of necessity be the same as at present, i.e., 200 lb. By complete rebuilding of the superheaters the temperature could have been raised to any desired value.

These facts indicated that the investment in all new generating and auxiliary equipment, together with the rebuilding of the superheaters, would give a plant of only fair economy and one in which the design was seriously restricted by an existing building. Therefore, it appeared best to build an entirely new plant.

There were certain apparent advantages in leaving the



Delray Site Shows Impracticability of Extending Existing Plants



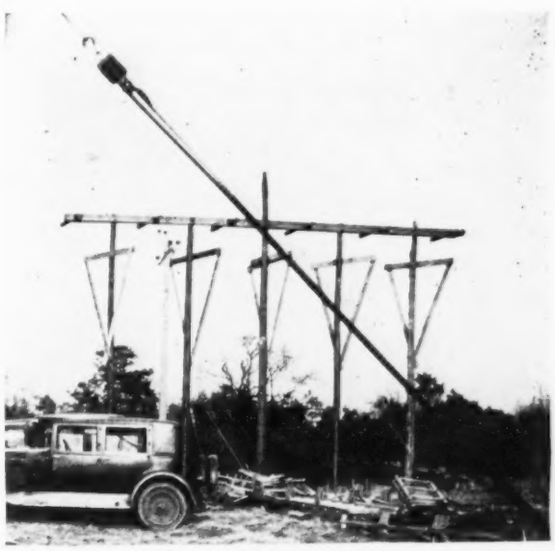
Two 50,000-Kw. Units Are Now Operating

two old power houses undisturbed and building an entirely new, modern type plant, containing in its first section two 50,000-kw. turbo-generators and sufficient boiler capacity to serve both of these generating units at their full load ratings.

Following the study made by company engineers it was estimated that by the time this new plant was needed the boilers in old power house No. 1 would have to be taken out of service permanently, leaving the boilers of power house No. 2 available for supplying steam to the turbines of power house No. 1 or No. 2 up to a generator output of about 80,000 kw. This output, being generated at 4,800 volts, could, if advisable, continue for the next few years to serve without transformation the considerable amount of 4,800-volt load in the vicinity. The available capacity in excess of that required to supply the 4,800-volt load could very well serve for many years as a reserve when required, or merely as a standby against the loss of one of the generating units of the new power house No. 3 at times of maximum system load. Based upon experience, it is expected that on about two or three days of any year the total system load will reach a value of from 25,000 to 35,000 kw. above that of the normal maximum day load. Such reserve in the old power houses would obviously be much cheaper than reserve which would be available from new equipment, unless, perhaps, a plant was constructed for strictly stand-by purposes.

Considering, therefore, all advantages in leaving the old power houses undisturbed, *pro tem*, it became obvious that the needs of the system could be better served by constructing a new power house designed to give a good operating economy. Construction was, therefore, started on Delray power house No. 3 in 1927. The plant went into operation in August, 1929, with one 50,000-kw. unit, followed by another available for service the following month. This comprises only the first step toward the ultimate plant, which has been designed so that five additional generating units of 50,000 kw. or perhaps larger, together with their complement of boilers, can be installed in the space available for extension.

Temporary Pole Structures for Substation Dead-End

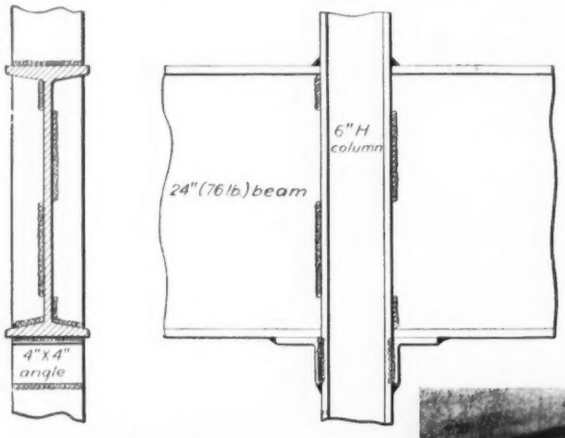


ON A 66-kv. substation job in the East it was necessary to place two circuits in service before the installation of steelwork could be made and the task was quickly handled by erecting wooden temporary towers of the type shown above. The triangular framing shown on each pole carried a horizontal platform to expedite the attachment of suspension insulators to the horizontal crossarm, these braces being left in place before dismantling the racks as a whole on account of the temporary nature of the work.

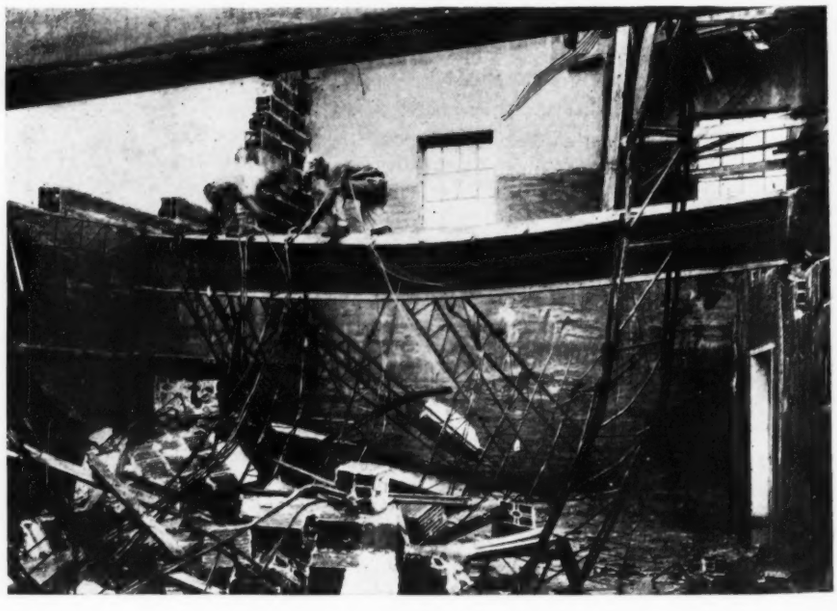
Welding Withstands Hurricane

Wall blown in, concrete beam wrecks rest of structure, but welds hold under extreme stress

THE completely arc-welded steel framework of a large fruit-packing house in Florida proved a match for a terrific hurricane which laid low all buildings of ordinary construction in the immediate vicinity. The packing house was in the process of construction at the time of the hurricane, half of the roof purlins being in place. The hurricane approached the building from the rear, blowing in the rear wall, going through the entire length of the structure and blowing out the front wall. The rear wall was blown in on top of the end bay, which was entirely framed ready for metal lath and concrete slab. Most of the damage was done by a concrete beam of the end wall striking the steel framework. The bar joists were held in place on the supporting beams by short fillet welds along the edges of the bearing plates at the end of the joists. Even though the entire wall fell on these bar joists, causing them to bend almost to the floor slab, the welds held the joists to the beams, causing even the beams and the supporting columns to become badly distorted. In order to clear away the wreckage, it was necessary to cut the bar joists from the beams, the welds being in practically perfect condition.



Detail of Column-to-Beam Welds



Welded Beam Distorted Without Failure

The tremendous force which twisted the beams and columns did not affect the arc-welded connections, none of the welds in these connections being broken. The accompanying sketch shows the detail of typical beam to column connections. Angles 4x4 in. were arc welded to the faces of the column flanges to form the beam seats. The beams were butted against the faces of the column flanges and joined to the columns by fillet welds.

Another advantage of arc-welded construction over riveted construction was the ease of replacement and repair to the distorted members of the steel framework. The H-column was distorted for a distance of 3 ft. from its top. This distorted portion of the column was cut off with a gas torch. A new section was spliced to the remaining portion of the column by simply placing the top section on top of the remaining part of the original column, forming a butt joint, which was then arc welded. A continuous weld around this butt joint made the spliced column a solid steel column. Due to the fact that no shop fabrication or punching of members was required for the arc-welded construction, it was possible to obtain new steel direct from the warehouse ready for erection.

The structure was erected by the Arch Engineering & Construction Company, Orlando, Fla., which used three "Stable-Arc" gas-engine driven welders manufactured by the Lincoln Electric Company, Cleveland, Ohio, to supply the current for arc welding the steel structure. Approximately 1,200 lb. of welding electrodes were used in the fabrication of the steel framework.

Hydro Construction Decreasing

A VERY marked decrease is noted in the capacity of new water-power plants constructed this year, according to a recent statement issued by the statistical research department of the National Electric Light Association. The total will probably not exceed 250,000 kw., as compared with a figure of 619,000 kw. installed during 1928. The bulk of the new construction is in steam-generating stations, the first units of two very large new plants having been put in operation during the past summer. One of these, the State Line plant which is located near Chicago, contains the largest individual turbo-generator that has so far been put into service. This one unit of 208,000 kw. accounts for nearly 20 per cent of the year's increase in power plant capacity.

West Virginia Governor Opposed to

Encroachment of Federal Authority

By WILLIAM G. CONLEY
Governor State of West Virginia

The Couzens communications and power bill, which, among other things, proposed to place the transmission of energy across state lines under federal regulation, will be brought up for vote in our national legislature shortly. Utility companies have their opinions regarding its justification and have the right to present their views individually in their respective territories or collectively before the nation. To get an expression of opinion from others concerned besides those directly interested in utilities, the ELECTRICAL WORLD *has asked the chief executives of every state to give his view of the bill. Governor William G. Conley of West Virginia has the following to say:*

THE Couzens communications bill provides for federal regulation of:

1. Radio communication, which is proper from the fact that such communication is almost entirely interstate, and not local.

2. Telegraph communication, which is also proper, for the reason stated above.

3. Telephone communication, which is of doubtful propriety from the fact that most of the telephone business is of a purely local character.

The provision of the bill whereby the extreme provisions of Section 13, paragraph (4) of the transportation act of 1920 are included, is an unnecessary encroachment on state authority to regulate purely local service. By this provision it would be possible for the proposed new federal commission to paralyze state rate making for telephone service, just as the Interstate Commerce Commission has done to railroad rates, when there is such a wide difference in the character of telephone and railroad service. The former is overwhelmingly an intrastate service, while the latter is largely national. The present situation, in which the Interstate Commerce Commission exercises limited jurisdiction over interstate telephone service, while all local service is subject to local control, is working satisfactorily to the public.

4. The production and distribution of electric power transmitted in interstate commerce. The bill provides that rates for power transmitted in interstate commerce shall be just and reasonable, and forbids the abandonment of any such service without obtaining authority so to do from the "commission on communications and power."

Briefly, the bill provides for regulation in the following manner:

(a) A state commission may make complaint to the proposed federal commission of the reasonableness of the rates charged the people of the state for electric energy so transmitted.

(b) A substantial number of consumers of power so transmitted may make like complaint.

(c) A distributor or consumer of power so transmitted may make complaint that service has been abandoned without authority from the commission.

(d) Any complaint of either character must be referred to a joint board of state representatives for hearing and decision.

(e) The decision of such joint board may be appealed to the commission on communications and power with leave to take additional evidence.

Federal regulation of the production and distribution of electric power, as provided in this section of the bill, is not necessary, and proceedings thereunder will be cumbersome, expensive and subject to long delays.

Less than 10 per cent of the electricity generated in this country is transmitted across state lines. Two-thirds of the energy so crossing state lines is transmitted and sold to the public by the same or affiliated corporations, in the several instances, and that business is under state regulation to the same extent as is the business of generating and selling power within a single state. Pennsylvania Gas Company vs. Public Service Commission, 252 U. S. 23, 64 L. ed. 434, which decision was clarified in Public Utilities Commission R. I. vs. Attleboro Steam & Electric Company, 273 U. S. 83, 71 L. ed. 549, P. U. R. 1927B 348. The Attleboro case quotes the opinion of our own Court of Appeals in Coal & Coke Company vs. Public Service Commission, 84 W. Va. 662, 669, with approval.

The vice of the proposed legislation lies in the situation that would be created in the average state on the commingling of 3 per cent of the electric energy that

would properly be the subject of federal control with the 97 per cent that is certainly of no national character and in which the federal government can have no interest. The result would be federal regulation of all electric rates, against the manifest intention of constitutional law and with no grounds of necessity therefor, even if such regulation were contemplated by federal and state constitutions.

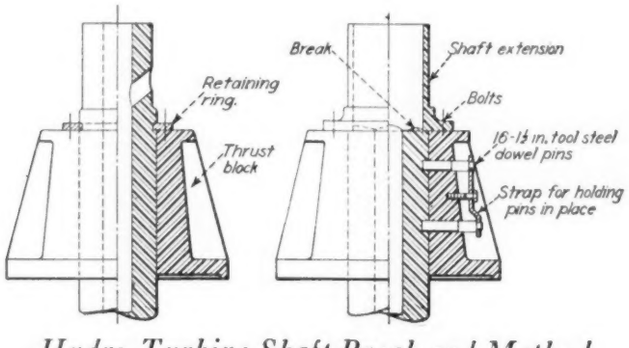
The reference of complaints against rates or abandonment to a board composed of representatives of the interested states is merely a gesture of comity. It is a commendable proposition in the abstract. The state representatives, however, have no final administrative power. They are little more than examiners. Moreover, the bill provides for judicial review of the proceedings under the entire act by the Court of Appeals of the District of Columbia, which is unfair and ought not to be permitted.

I am opposed to further encroachment of the federal government upon the rights of the states. Congress has gradually extended the federal field of operation along lines never dreamed of by the founders of the Republic. Boards, bureaus and commissions, with broad authorities conferred and constantly acquired, have been created to regulate and control the activity of the citizen, both individual and corporate, until a large percentage of the adult population is on the public payrolls. And these boards, bureaus and commissions have gradually reached out and assumed the control of functions of government that should and ought to be carried on by the respective states.

It seems to me that the time has come when these encroachments of federal authority on the rights of the states should cease.

Hydro-Turbine Shaft Repair

WITHOUT doing any great harm to the machine, the shaft on a 1,750-kw. vertical hydraulic turbine on the system of the Northern States Power Company broke off quite cleanly at the point where the retaining ring was keyed in above the bearing thrust block. The unit had to be restored to service as soon as possible and the delay dependent upon the delivery and installation of a new shaft was to be avoided if possible. In order to accomplish this the rotating element was jacked back into place and sixteen holes in two circles of eight each were drilled through the body of the thrust block and into the shaft for a short distance. Tool steel dowel pins were forced into these holes and vertical pairs secured in place by short straps, as shown in the accompanying illustration. A flanged collar was bolted on the top of the thrust block to hold a hollow shaft extension on which the slip rings were mounted as it had been on the original shaft. The machine has been running for more than a year since this repair was made and apparently it is strong enough to continue running indefinitely.



Hydro-Turbine Shaft Break and Method of Repair

Original design of shaft shown at left, repaired section at right.

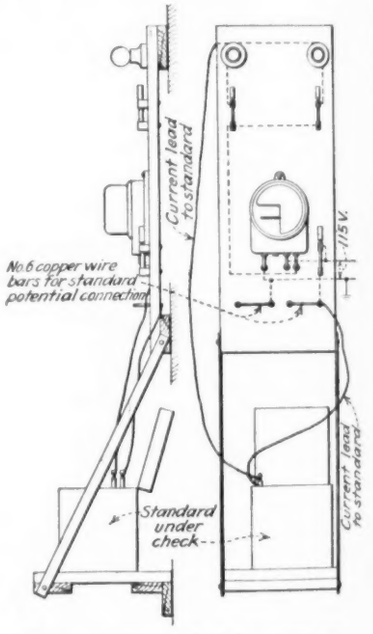
Testers Check Standards

By O. P. Stickney

Meter Engineer Nebraska Power Company, Omaha, Neb.

IN THE methods used at present the personal equation cannot be entirely eliminated from service meter testing. But although it cannot be eliminated it can be minimized or made to result in an improvement in, rather than an impairment of, accuracy. This is accomplished in the meter department of the Nebraska Power Company by a practice that makes use of the equipment here described.

When a meter tester of this company returns to the shop after his day's work he checks his rotating standard himself on a specially built board, on which are mounted a carefully calibrated house type meter with switches for light and heavy loads and terminals for connection of the leads from the standard. The meter has a special cover that blocks off the register and one-half of the normal disk exposure. This gives a sharp, fixed edge against which the movement of the mark on the disk is observed. The tester takes one light and one heavy load run on his standard. The check takes only a minute or so, but it assures the tester of the accuracy of his standard or indicates that it is in error.


Current lead to standard
No.6 copper wire bars for standard potential connection
Standard under check
Current lead to standard

Board for Making Daily Checks of Rotating Standards

These checks made by the testers do not substitute for the routine laboratory checks of standards, which are made as usual. No record is taken of them unless a tester finds that his instrument is in error. One function of the daily check is to maintain a continuous supervision over the accuracy of rotating standards in the intervals between laboratory tests, but the more important effect is on the meter tester. He knows that his standard is right; he does not have to take anybody's word for it, he made the test himself and feels no inclination to shift responsibilities.

Urges More Consideration of

Wood Line Structures

Flashover characteristics compared with designs. Suggests changes better to utilize wood insulation. Increased competition with steel anticipated. Results of experience

By R. E. ARGERSINGER*
Chief Electrical Engineer
Stone & Webster Engineering Corporation

A GREATER use of wooden construction should be studied in transmission practice on the grounds of both reliability and economy. This conclusion is the outcome of an analysis of the operating records of power companies serving communities in three states sufficiently separated to avoid a regional bias. In the accompanying illustrations a number of types of wooden line construction are illustrated and the designs analyzed in terms of flashover characteristics and outages obtained in regular service, with the objective of finding leads toward better construction.

SUGGESTED IMPROVEMENTS IN DESIGN

Some of these types of construction can be improved by the engineer. In the case of Fig. 1 a pole 5 ft. higher could be used with the ground wire carried at the top. If then the ground lead is attached to the ground wire about 4 ft. out from the pole and carried down at an angle to reach the pole at the point of guy attachment, the result would be much better. Using the assumptions made in the text associated with the cut, the insulation strength becomes 1,150 kv. and the induced potential becomes 525 kv., giving a flashover characteristic of 0.5.

This same change could be used advantageously in the line of Fig. 2. If a 10-ft. crossarm were used, increasing the effective wood length 4 ft., the insulation strength would become 1,290 kv. and the induced potential one-half that amount.

**Based on a paper before the Lehigh Valley section, A.I.E.E.*

Summarized Data on Flashover Characteristics and Lightning Outages

Fig.	Line Type	Flashover Characteristic	Lightning Outages per Hundred Miles 1927	1928	1929 (Half)
1	T-1	1.5	71	80	29
7	A	1.4	97	86	17
2	T-2	1	..	62	0
1	T-55-57	0.9	..	*2	13
3	T-6	0.8	35	32	..
4	B	0.6	6	3	3
5	T-50	0.4	..	*2	15
6	T-5	0.4	4	13	0
8	C	0.3	60	35	†13
9	EP-2	0.6	Under construction		
10	EP-1	0.6	Under construction		

*One-half year. †Rough approximation.

The improvement achieved by the design of Fig. 8 over that of Fig. 7 is not as great as might be hoped for, and probably for the following reasons:

1. Presumably wood pole insulation is less effective than wood crossarm insulation. The arms are doubtless

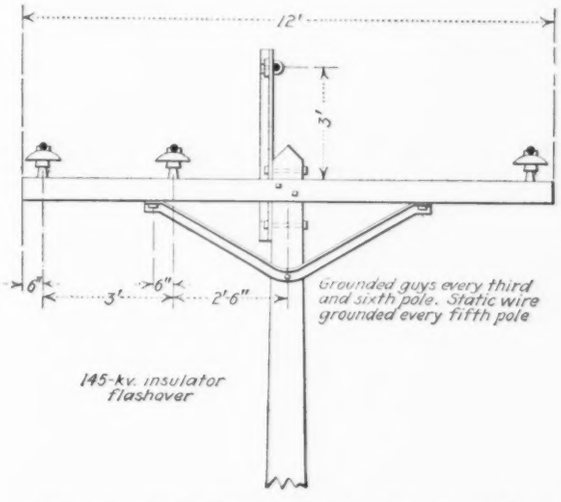


Fig 1—Pin Type 33-Kv. Line with Ground Wire (T-55-57 T-1)

Using Peek's values, the 6 in. of wooden crossarm between the middle insulator and ground can withstand 90 kv. impulse voltage. Assuming 250 kv. impulse strength for the insulator, the total minimum insulation strength for the line becomes 340 kv. For 40-ft. poles, 35 ft. average wire height above ground, and assuming that the ground wire reduces the induced potential 50 per cent, the potential on the wires for a voltage gradient of 30 kv. per ft. becomes about 525, or 1.5 times the minimum insulation value. This index figure may be called the flashover characteristic of the structure. In this design the pole insulation value is adversely affected by the number of guy wires and down leads from the ground wire.

Omitting the ground wire in the above figure and guying the line as T-55-57, the only ground connections are the guys, 6 ft. below the crossarm. The impulse strength for wood becomes 900 kv. and the total insulation strength 1,150 kv. The induced potential on the wire for the same gradient is 1,050 kv. and the flashover characteristic 0.9. This line shows fewer lightning outages per 100 circuit-miles than T-1 and emphasizes, not the lack of value of ground wires, but the importance of their proper installation.

better seasoned and contain less green and therefore less conducting material. The experiments of Austin at his laboratory at Barberton indicate that crossarms exceed poles in insulation value per foot.

2. The protective value of the ground wire is somewhat less due to its greater distance from the phase wires.

If we compare the performance of this line with that of Fig. 4 we find that there is much more effective wood insulation in the former, but that the latter carries porcelain insulation of much higher strength and, after all, porcelain is more dependable than wood for this purpose. I am inclined to think that we should not allow much above 90 kv. per foot for pole insulation. If we do this and slightly reduce the protective value of the ground wire we obtain an insulation strength

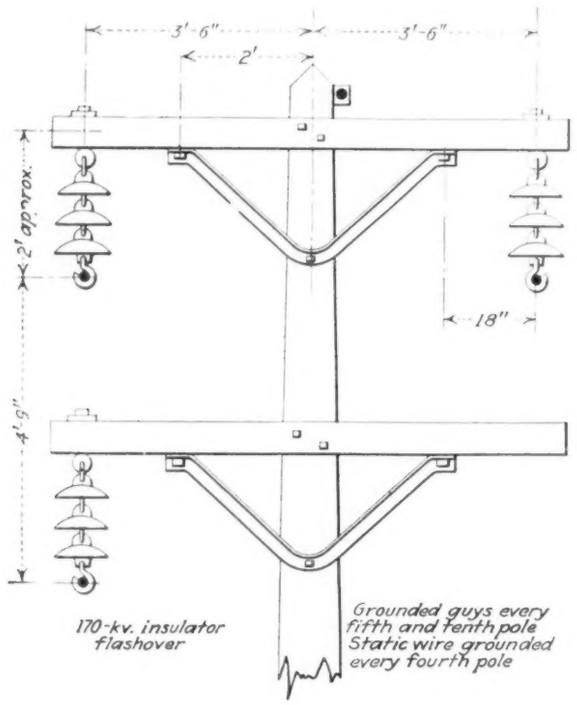


Fig. 2—Suspension Type 33-Kv. Pole Line (T-2)

Assuming 300 kv. impulse strength for the insulator string and 1.5 ft. of effective wood, the minimum insulation strength becomes 570 kv. With top wires 40 ft. above ground and allowing for the ground wire, the lightning potential on the top wires becomes about 600 kv. and the flashover characteristic 1. In this construction there appears to be insufficient additional insulation (compared with Line T-55-57 in Fig. 1) to care for the increased induced potential due to greater line height. The poles in Fig. 2 are 50 ft. long. In 1928 there were 62 outages from lightning per 100 circuit-miles.

of 1,030 kv. with an induced potential of 660 and a flashover characteristic of 0.6. This would indicate not quite such good performance as from the Fig. 4 line, although the actual difference in behavior is much greater than would be expected from the figures.

It will also be noted that the insulation of lines Fig. 4 and Fig. 8 is distributed in an entirely different manner: Fig. 4, line to ground, 1,030 kv.; phase to phase 2,060 kv. Fig. 8, line to ground, 1,660 kv.; phase to phase, 1,340 kv.

While (4) is much weaker phase to ground, (8) is much weaker between phases, and that this weakness is largely responsible for (8's) relatively poor performance

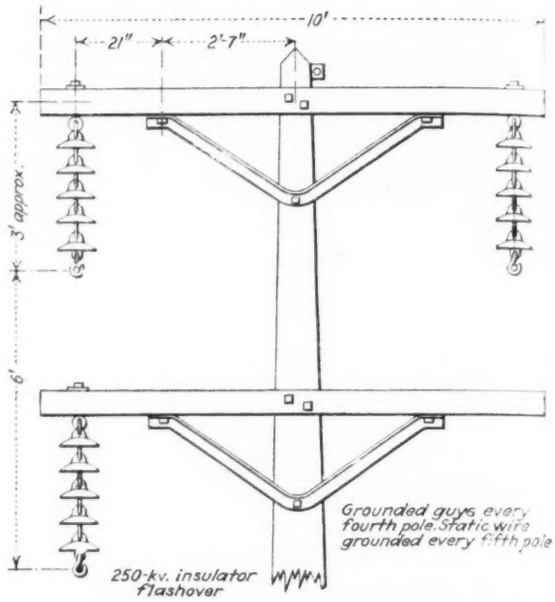


Fig. 3—Suspension Type 66-Kv. Line with Five Disk Insulators (T-6)

On this line the insulation strength is about 500 kv. plus 1.5 ft. of wood, or 770 kv. With 50-ft. poles the top wires are about 40 ft. high and with the ground wire should be subjected to about 600 kv. with a characteristic of 0.8. Crossarm fires gave trouble on this line until one disk was added at the end of 1928 and the suspension eyebolts bonded but not grounded. It is believed that an insulation strength of 1,650 kv. and a flashover characteristic of 0.3 might be obtained by putting the ground wire on a pin-type insulator and carrying the ground wire downward at an angle and about 4 ft. out from the pole. The lightning outages for 100 circuit-miles last year were 32.

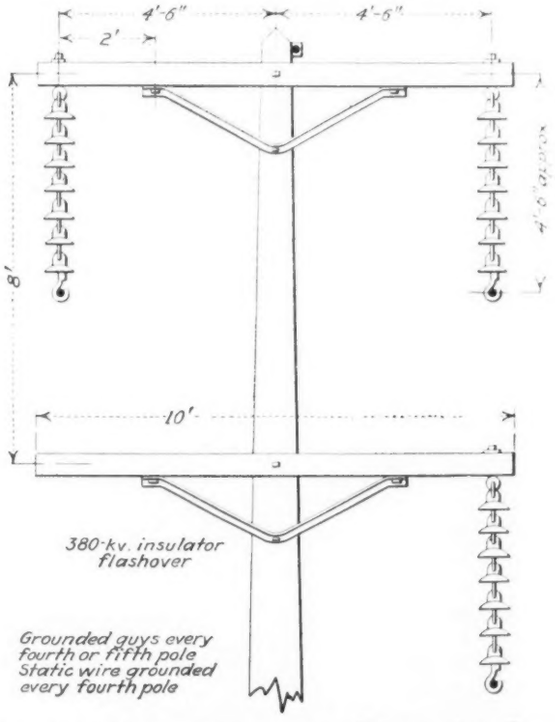


Fig. 4—66-Kv. Suspension Line with Seven Disk Insulators (Type B)

Using seven disks in the design of Fig. 3, the insulation strength is about 1,030 kv., the induced potential being about 585 kv. and the flashover characteristic 0.6. Heavy lightning incidence exists in this territory. No crossarm fires have occurred and the outage record from lightning

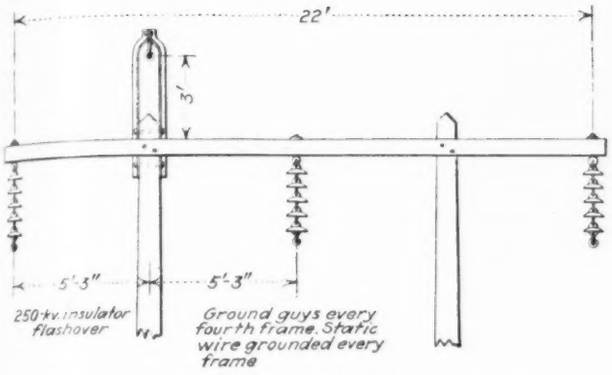


Fig. 5—Single-Arm, 66-Kv. Line with Flexible Ground Wire (T-50)

This line uses 50-ft. poles with wires about 40 ft. high. The amount of wood in service tends to offset the reduced protective effect in relation to one phase wire. Assuming 5 ft. of wood effective, the insulation strength is 1,400 kv. and the induced potential 600 kv. with a characteristic of 0.4. The record is too short to throw much light on the value of the design. No broken ground wires have occurred. There were fifteen lightning outages per 100 miles in the first half of this year.

is substantiated by the fact that the most of its interruptions involved two or three conductors. Apparently in building up our insulation to ground, as a protection against lightning, we must not lose sight of the fact that the other conductors through their capacity to ground afford a discharge path for lightning, and a reasonable balance should be maintained between insulation to ground and that between phases.

Some Steel Tower Line Experiences

A few cases of steel structure line performance may be reviewed.

One system has a number of 110-kv. steel tower lines insulated with nine suspension units and equipped with one ground wire. Such construction should give us a characteristic of 1.0. The same company has a wood H-frame line using eight insulators and no ground wire which should show a characteristic of about 0.5. The record is too short to draw any conclusions, but in eighteen months' operation the steel line has had sixteen lightning outages and the wood line fourteen.

In another case there are some 700 circuit-miles of steel tower line partially double circuit and about 950 miles of wood H-frame. These lines carry two ground wires, operate at 110 kv. and in general have seven

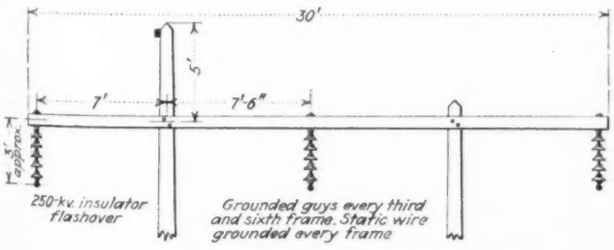


Fig. 6—66-Kv. Line Designed for Future 132-Kv. Service (T-5)

This line was built with 55 and 50-ft. poles. Assuming 6.5 effective feet of wood, the insulation strength should be about 1,670 kv. and the induced potential 600 kv.; characteristic, 0.4. There were thirteen outages per 100 miles last year and none in the first half of this year. The data are somewhat inconclusive, but indicate improvement over the line in Fig. 3.

insulator units on tangent structures. The record shows no mechanical failures for the wood structures during 1927 or 1928 and one mechanical failure of a steel structure occasioned by a cyclonic wind. This overturned the structure, pulling the anchorage out of the ground, which was water-soaked due to floods. In 1927 there were 63 insulator string failures from all causes on the steel lines and 35 on the wood. Lightning outages

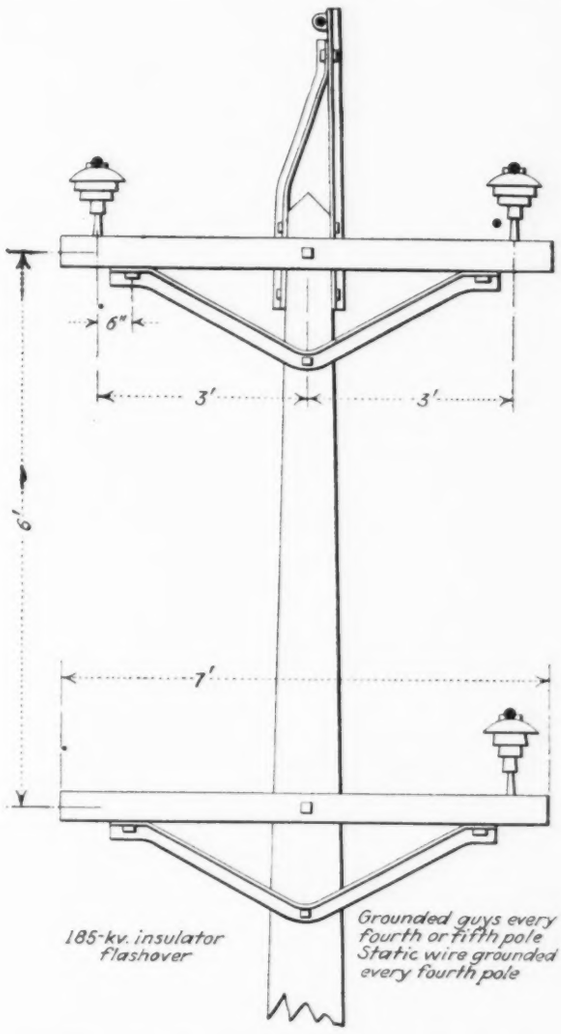


Fig. 7—Low-Cost Line to Serve Secondary Power Customer (Type A)

Cheap construction to serve a customer at a low rate with "dump" power resulted in poor lightning protection on this 66-kv. line. The wire height is about 43 ft., little wood is used and the insulation strength hardly exceeds 450 kv. The induced potential is about 650 kv. and the flashover characteristic 1.4. The territory is subject to lightning storms and there were 86 outages per 100 miles last year.

were not segregated. In 1928 there were 109 string failures from all causes on the steel and 141 on the wood lines. There were 93 string failures from lightning on the steel and 65 on the wood structures. It is probable, however, that the exposure was somewhat worse on the steel than on the wood lines.

Another company reports several hundred miles of both steel tower and wood H-frame construction in service at 100 kv. for a number of years. It summarizes the performance of the two types of construction as follows:

As far as mechanical failures of structures and conductors are concerned, one can be made as reliable as the other. As far as insulator failures go, the wood construction has a decided advantage.

Still another company using both kinds of structures makes a report which may be summarized as follows:

During 1927 and 1928, with 90 miles of wood H-frame and 145 miles of single-circuit steel towers, at times when there were no storms, there were no failures on the wood, but seven conductor failures and five insulator failures on the steel lines.

During storms there were, during 1927, 6.7 flashovers per 100 miles of the wood and 16 on the steel structures. During 1928 there were sixteen flashovers per 100 miles on the wood and eighteen on the steel towers.

The foregoing method of arriving at insulation values

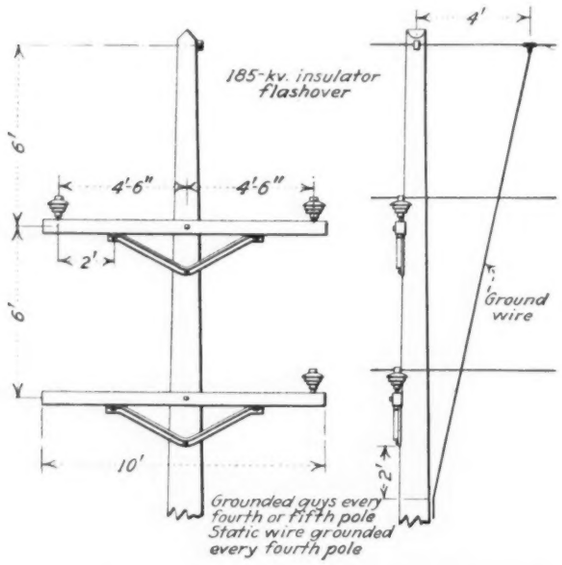


Fig. 8—66-Kv. Line with Outboard Ground Wire Tap (Type C)

On this line the 50-ft. pole was used and the crossarm lowered to 6 ft., with 10-ft. arms and outboard ground wire tap. Assuming 7 ft. effective wood plus the insulator, the insulation strength totals about 1,660 kv. and the induced potential 550 kv., flashover characteristic, 0.3. Outages have been reduced from 60 per 100 miles in 1927 to thirteen in the first half of this year. Some improvement over the design of Fig. 7 appears.

for the structures described is obviously not highly accurate. It is probably incorrect to add directly flashover values for wood and porcelain. The recent Institute paper by Melvin gives a great deal of valuable data on this subject and should serve as a basis for analyzing the problem. I have simply tried to indicate a rough method for arriving at comparative values of various arrangements from which some estimate may be made of probable line performance.

Wood vs. Steel

The principal objections to wood pole structures are that they have short life and are subject to shattering from lightning or burning from leakage currents. The latter can, no doubt, be prevented by proper selection and arrangement of insulators, particularly under the ground wires. It seems probable that shattering can be materially reduced by using ample porcelain insulation and proper metal pole caps and crossarm tips. The use of double arms clamped together at the ends by

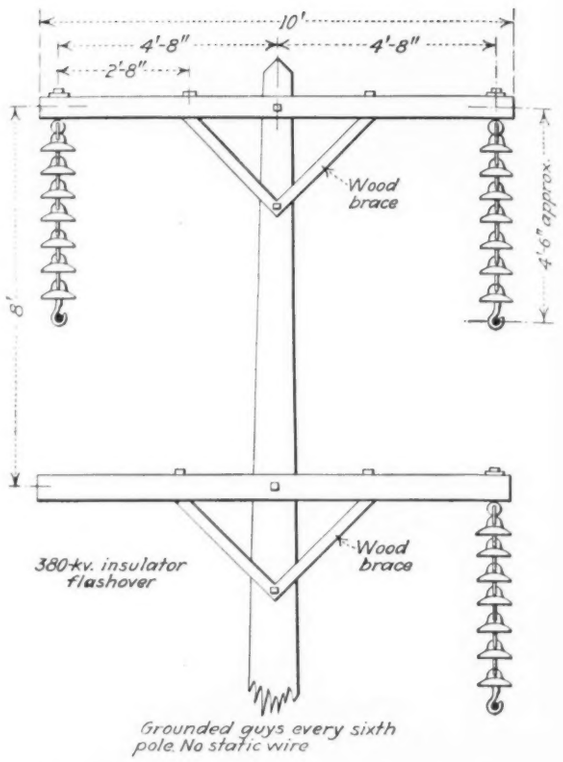


Fig. 9—66-Kv. Line with Wooden Braces and No Ground Wire (Type E P-2)

On this line the grounding opportunities were too poor to justify the installation of a ground wire. The insulation strength is estimated at 760 kv. for the insulator string, 180 kv. for 4.5 ft. of crossarm and 90 kv. for 6 ft. of pole; total 2,110 kv. The induced potential is 1,170 kv. and the flashover characteristic 0.6. This line is under construction.

rather heavy metal fittings should give good results. It must be admitted that the life of wood structures is uncertain, but from such data as are available it would seem not unreasonable to assume that no considerable replacements of high-grade, properly treated poles would have to be undertaken in less than twenty years. Remembering that wood structures, to give equal service, should on the average cost less than steel, and remembering, further, the large mileage of lines which should be built and the need for reducing construction costs, it behooves us to analyze our transmission line designs very carefully before deciding to build them on steel structures.

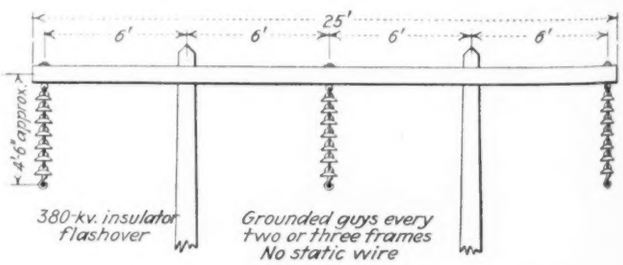


Fig. 10—66-Kv. Single Crossarm Line (Part of Line of Fig. 9) Type E P-1

This structure has about the same insulating characteristics as the line section of Fig. 9 and is used under different right-of-way conditions. It is under construction.

Transformer Installation Inspection

By W. K. Danvers

Superintendent Maintenance and Reclamation, Oklahoma Gas & Electric Company, Oklahoma City, Okla.

CERTAIN definite inspections and tests should always be made on power transformers after they have been set in place and before they are connected up and put into service. The first inspection is a mechanical one. In this the transformer should be thoroughly looked over for any damage that may have been done to the job in handling. Radiator pipes or fins with usual welded connections should be closely examined, because a slight pressure from a winch line or from scraping against another object will sometimes open a joint and start an oil leak that is very hard to locate and repair after the transformer is in operation. Assurance should be made that all drain cocks, sampling valves, filter connections, all gages and thermometers are in place and that all of their joints are tight. The oil should then be sampled for a dielectric test and if it is necessary should be reconditioned.

After the bushings have been installed the transformers should be meggered for insulation resistance, or given a high potential test of twice the rated voltage of each winding. The megger is most commonly used as high potential is not usually available in the field. Megger measurements should be taken between the low-tension winding and ground and between the two windings. In general, a power transformer of average size should be considered satisfactory if its cold resistance test averages three megohms for each 1,000 volts of high-tension rating. In making insulation tests with a megger, or any other source of high potential, it is always advisable to connect the high-tension terminals together and also to connect the low-tension terminals together. If the insulation tests run appreciably lower than the values above mentioned it will be necessary to dry the winding before the transformer is placed in service.

There are several approved methods of drying out transformers, but probably the most convenient, under the usual field conditions, is to short-circuit either winding and to impress sufficient voltage across the other winding to circulate about 25 per cent full load current. This will usually be quite enough to raise the temperature of the transformer to about 80 deg. to 90 deg. C., above which it should not be allowed to go. The transformer should be in the case without oil and with the cover off for ventilation. Megger tests should be made every few hours at the start, and these tests plotted in a curve against time in order to show the progress of the drying out process.

The handhold cover should then be removed and the internal connections of the transformer should be carefully checked, especially if it has a series parallel secondary winding. The winding should then be given a ratio check with a voltage sufficiently high on the high-tension side to give a good reading on the secondary. Separate checks should be made on each unit of the multiple secondary winding. The transformer should then be tested for polarity to determine whether it is additive or subtractive. In this test all of the secondary coils should be connected in series, otherwise each coil will have to be tested separately.

With all the electrical tests completed and the proper tap settings made the tank top, bushing flange and handhold plate bolts should be tightened. With the oil brought up to the proper level the transformer is then ready to go into service. It should go on the line by energizing the high-tension side first and if it is to be banked with other transformers both high side conductors should be closed at the same time if possible. The low-tension side should then be phased out and permanent connections made. If the bank is to operate in parallel with another bank of transformers the low-tension voltage, the phase rotation and the polarity of the whole bank should be checked against the bank already in service.

Cable Maintenance Permits Reuse of Sections

A THREE-CONDUCTOR 350,000-circ.mil, steel-wrapped aërial cable which has been in use for more than six years by the Westchester Lighting Company was recently reinstalled for the third time. According to A. D. Clark, superintendent of lines, it is the practice of the utility company to paint the cable after installation at least once every two or three years to prevent the rusting of the steel wrapping.

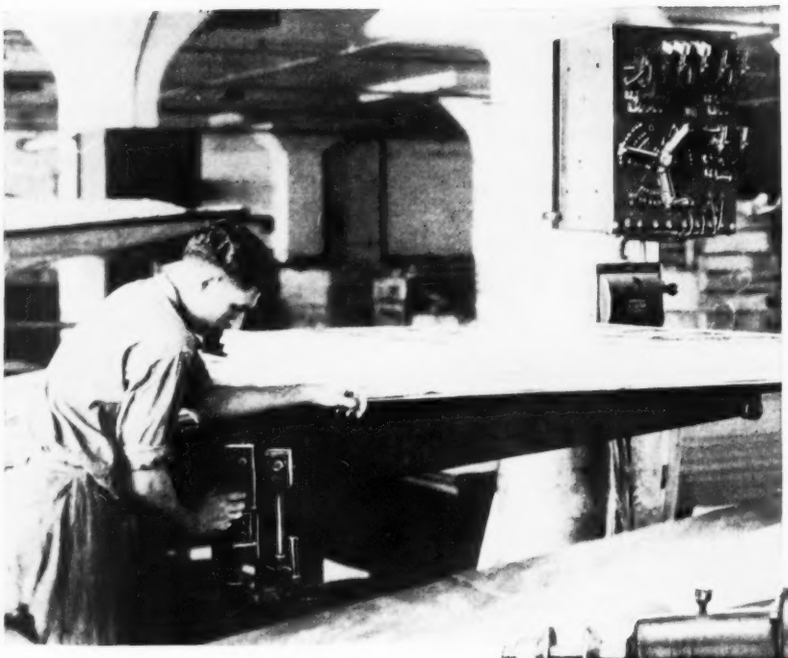
Curved Conduit Serves as Automatic Painter for Aerial Cable

Painting of the cable was formerly done by installing a temporary messenger, allowing the lineman to ride the messenger with his safety belt around it and paint the cable by brush. A new method, which, according to Mr. Clark, has a number of advantages over the old, has been devised. The improved plan, inasmuch as it eliminates the hazard of having the lineman ride the messenger, is safer and is also a cleaner way of doing the work. The cable passes through a 5-in. conduit section which is filled with an air-drying varnish. It is said that a 100 per cent paint job is obtained. Any surplus of fluid on the cable drops into a can, as shown.

Automatic

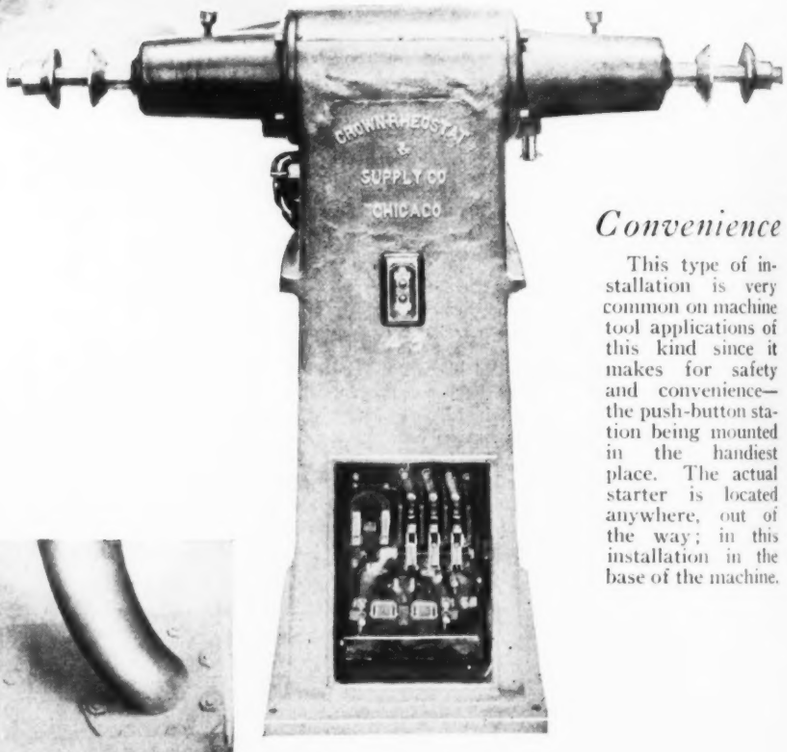
What

Automatic controllers have been developed for many electrical applications and have many advantages over manual controllers that offset their increased cost. Typical advantages of automatic controllers are shown



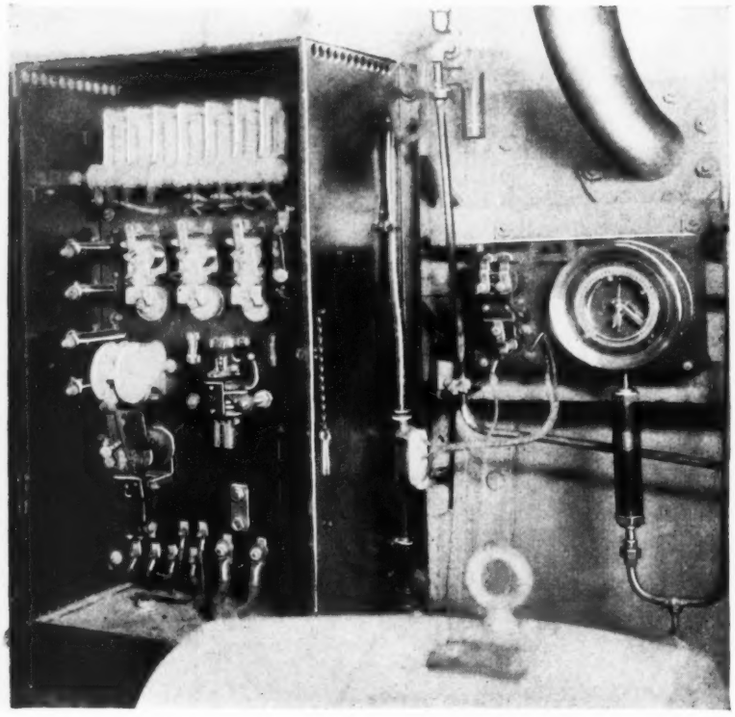
Space Saving

A lithographic press controlled by an a.c. starting and speed regulating controller located on the wall. To start or stop the press the operator presses the corresponding button located in a convenient position on the machine. While doing this he can give his whole attention to the machine. As a safety measure additional stop buttons are generally located at convenient points around the machine.



Convenience

This type of installation is very common on machine tool applications of this kind since it makes for safety and convenience—the push-button station being mounted in the handiest place. The actual starter is located anywhere, out of the way; in this installation in the base of the machine.



Accuracy

An automatic controller on an air compressor. The compressor motor is started and stopped automatically by the gage type pressure regulator on the right, which, when the pressure is low, energizes a relay on the pressure-regulator panel. This in turn closes the main-line contactor—the one with the arc shields. The four current-limit accelerating contactors automatically and gradually shunt the starting resistance at the top of the case, as the motor current drops to the proper value after each current surge.

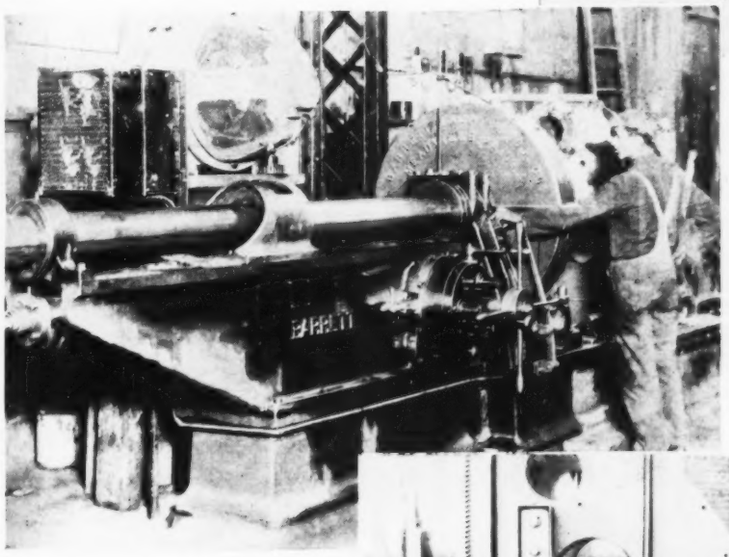
This controller dispenses with an attendant except for periodic inspection, and responds to pressures with a smaller error range than is usual with an attendant.

Control
Can Do

By
E. W. SEEGER
Cutler-Hammer Company

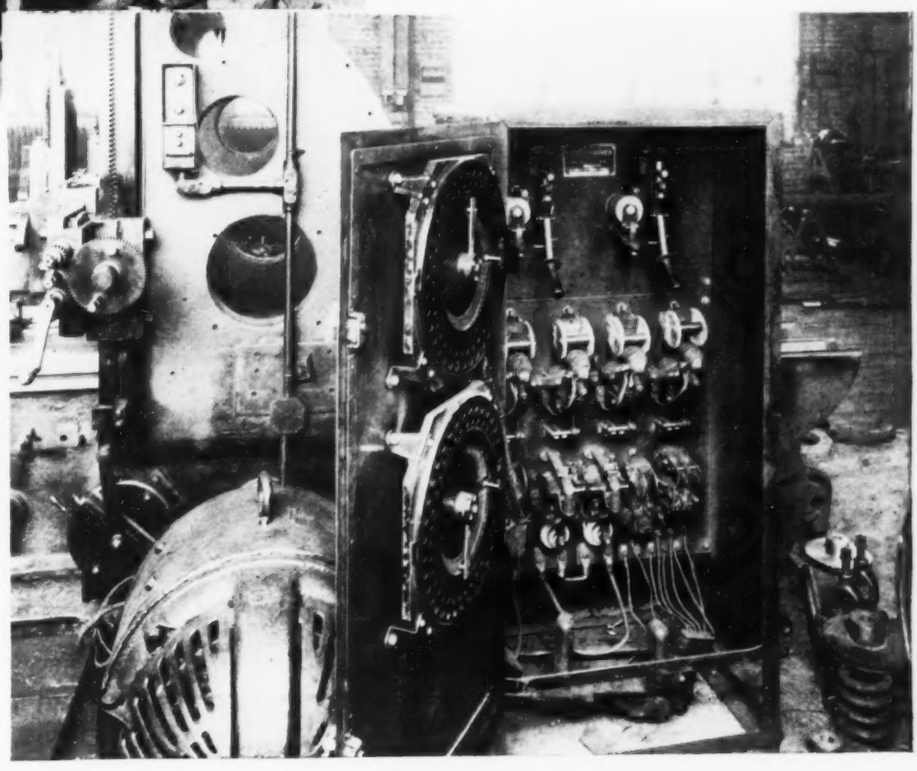
Difficult with Manual Controls

The operator of this Hulett ore unloader is in the control cab above the bucket. From this strategic position he controls through master switches the bucket closing motor, hoist and trolley motors. This is an outstanding example of the advantage of remote control, which in this case permits greater accuracy, speed in handling, greater safety and simpler mechanical construction than would manual control



Fatigue Saving and Safety

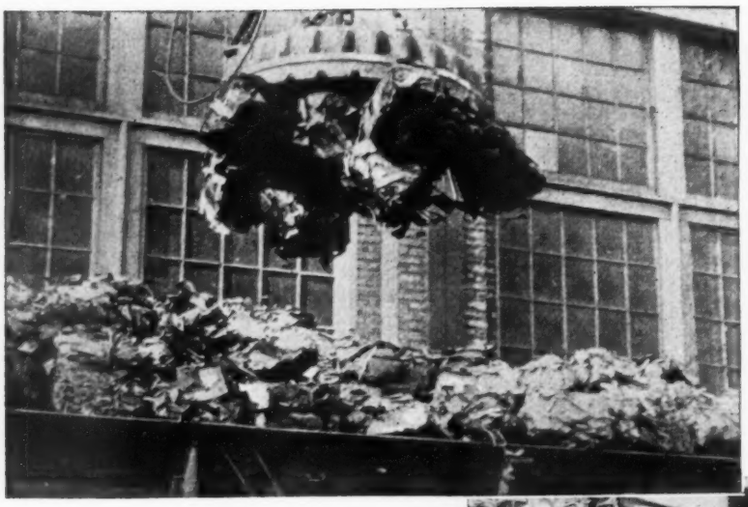
The motor and control are mounted on the boring mill, thus minimizing belt length and cable. The "start," "stop" and "inch" buttons are within easy reach of the operator. Speed adjustment and reverse operation are obtained by gears on the machine. The control comprises one main-line contactor, a dynamic braking contactor and two current-limit lockout accelerators, which also apply dynamic braking gradually.



Greater Speed

Direct-current full-magnetic reversing controller for a planer. While "setting up" the equipment is inched forward and reversed from a pendant push-button station. To start the machine after "set-up" a button located on the machine is pressed. Reversal and length of travel are controlled by a drum type reversing master switch on the side of the machine. This master switch is operated by dogs, the position of which is adjustable on the platen. The forward cutting speed is generally from 250 to 500 r.p.m., and the return speed 500 to 1,000 r.p.m., being adjusted by two rheostats.

The motor is reversed by plugging and stopped by dynamic braking, an important feature if the platen is at the end of its stroke. Instantaneous trip overload protection is supplied.



Labor Saving

Magnet picking up iron scrap. The magnet is wound with a large number of turns of copper strap insulated with asbestos and impregnated against moisture. The current to the magnet is controlled from the operator's cab by means of a drum type master switch operating two contactors. One contactor admits current to the magnet for picking up iron, the other momentarily reverses the current to release the iron.

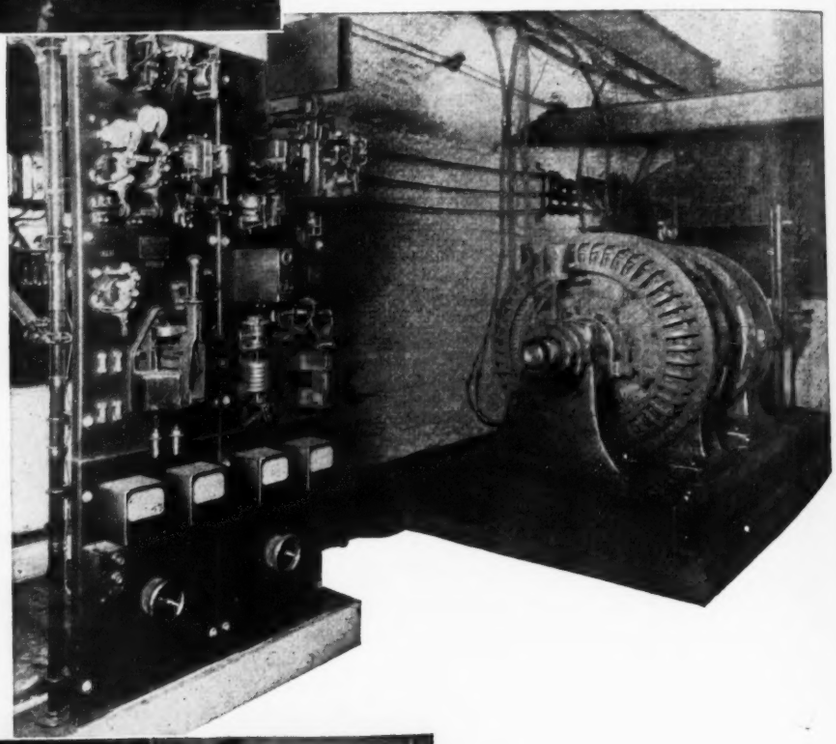
This type of magnetic control results in considerable labor saving when the material handled is awkward to pick up by an ordinary crane. Speed is also increased, since no shackles or chains have to be used.

No Attendant Necessary

An underground high-tension automatic substation in a coal mine for controlling a synchronous motor driving a generator. The main breaker is equipped with overload relays. All other switches and relays are magnetically operated. A stop and start button is located on the board and also at the remote control point.

The synchronous motor must be brought up to speed before the d.c. main-line circuit breaker is closed. After the d.c. load is reduced to safe limits the d.c. circuit breaker recloses. The equipment will start up automatically after failure of a.c. voltage. If the d.c. demand falls to zero the d.c. circuit breaker opens. It closes again when the demand comes on.

This equipment dispenses with an attendant for these operations, except for the initial placing in service of the synchronous motor.



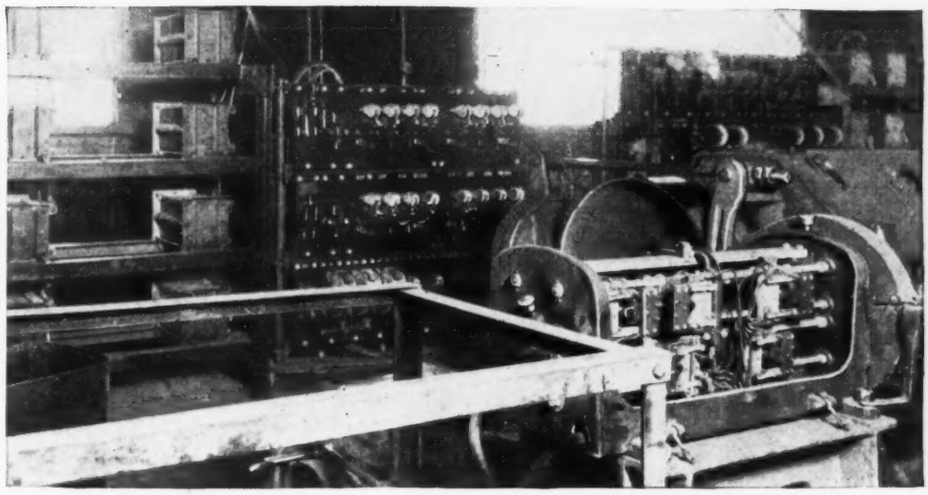
Remote Speed Control

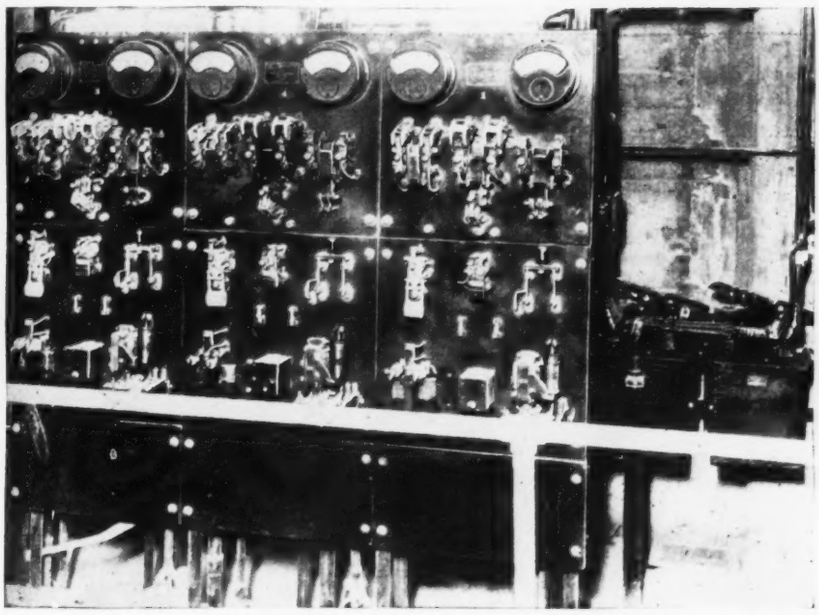
This equipment is used with an offset printing press which it is necessary to operate at a variety of running speeds. A master control station on the side of the press (not shown) gives fifteen different speed points by varying the resistance in the slip-ring rotor.

Accuracy of Control

A traveling cam limit switch controlling a car dumper. As the cam moves along the shaft it opens or closes various control circuits which automatically slow down, stop or reverse the action. The position of the limit switches is adjustable and they have a quick-break action.

Other mechanical devices can be readily connected in the control circuit. Common ones are overspeed governors, door and gate interlocks, floor selectors (for elevators), pressure and float regulators, anti-plugging devices, etc.





Motor Protected from Abuse at Starting

Three push buttons control three 400-hp., 2,200-volt low-speed synchronous motors. Pressing the start button connects the a.c. winding to the high-tension lines through the oil switches on the right. At this time the field circuit is disconnected from the line and short-circuited by a discharge resistor.

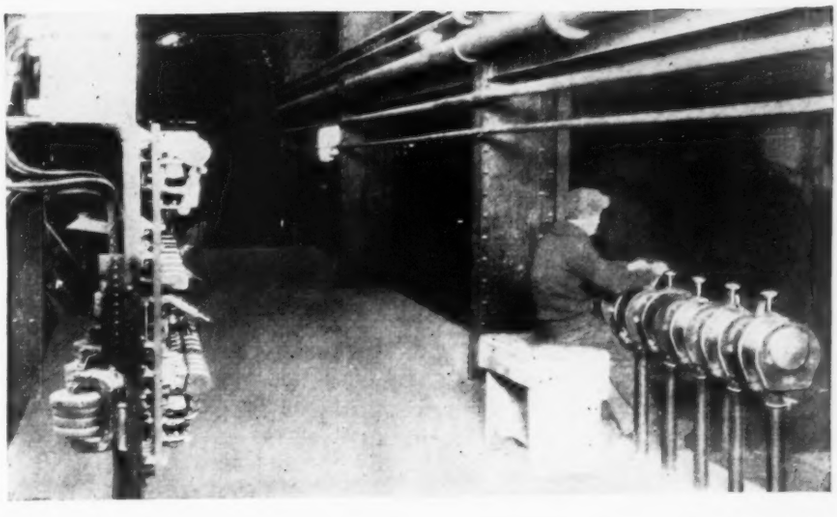
An auxiliary squirrel-cage winding on the pole faces of the rotor and the three-phase stator winding develop the starting torque. When the machine is partly up to synchronism a definite amount of field current is supplied to give maximum possible pull-in torque and bring the machine into step. The field current is also supplied at a definite point in the acceleration so as to get the minimum possible current peak with maximum possible torque when the motor pulls into step.

Can Group Control of Several Motors

A group of d.c. inductive time-limit controllers and master switches for operating chain-transfer tables for blooms. Each section of the transfer table is associated with a controller, motor and master switch. One man controls six sections of the transfer table.

The controllers are arranged for reversing by plugging and for acceleration by cutting out series resistance from the armature circuit. The rate at which the accelerating contactors close is controlled by reactance coils in the control circuit. No dashpots are needed and the rate of acceleration is almost independent of the load, forced acceleration being obtained on overloads.

Aside from permitting one-man control this arrangement facilitates wiring, maintenance and improves appearance.



Reduction of Eye Strain from Adequate Lighting

By M. Luckiesh

Director Research Laboratory, National Lamp Works, Cleveland

A USUAL method of appraising the value of improved lighting to industry has been to compare the output of work under the old system of lighting with that of the new. In addition to the advantage of increased production, the less readily measured effects of good lighting —such as reduction of eye strain and eyesight conservation—are sometimes mentioned. However, these less tangible effects are often advanced as a bonus rather than as basic compensation from the improved lighting. It is conservative to say that eyesight conservation is of far greater interest to the majority of those involved than is "production."

Since the trend in industry is toward facilitating the workers in performing their tasks, the factor of eyesight conservation, so important to the many, will form a powerful influence in establishing better lighting conditions.

Although no satisfactory and direct method has been devised to measure eye strain the subject can be approached indirectly and conclusions important to lighting practice can be obtained. The accompanying table summarizes the effect of intensity of illumination on the speed of vision in a specific visual task. The results are typical of many other experiments, although the minimum foot-candles at which maximum speed is attained depends upon the conditions of a specific case.

Illumination on Test Object	Time Required for Recognition of Test Object
1 Foot-candle	0.060 second
2 Foot-candles	0.038 second
5 Foot-candles	0.027 second
10 Foot-candles	0.022 second
15 Foot-candles	0.019 second
20 Foot-candles	0.018 second
40 Foot-candles	0.018 second

In this experiment the subjects were instructed to work at the limit of their ability in all cases. As the level of illumination was increased the eyes were enabled to function faster and did so, until a maximum speed was reached, which in this experiment was about 20 foot-candles. Thus, below a certain level of illumination the eyes take advantage of more light and operate faster. Above this level, since a further increase in speed is prevented by other factors, the benefit of more light is utilized in making vision easier and in reducing eye strain.

Perhaps it would be arbitrary to state that the value of lighting in eyesight conservation really begins at a level of illumination at which "production increase" stops; still, there are many reasons to support this idea.

Rural Electricity for India

AN INTERESTING hydro-electric project of considerable import to the rural and industrial electrification of the United Provinces of Agra and Oudh in northern India is nearing completion. It is specially noteworthy because the scheme proposes to utilize the various low-head canal falls which run through the province to their maximum capacity and to supplement the transmission system at times of low water flow by Diesel stations.

The project is known as the Ganges Canal scheme and is a development of three local projects, the Sumera hydro-electric scheme, the Bhola Falls scheme and the Ranganga hydro-power scheme. The three initial schemes have been linked together into a "grid" transmission system to supply power to 42 towns in seven northwestern districts and the East Indian Railway. The scheme is expected to be functioning fully by January, 1930.

The power will be generated at the Bahadurabad Falls and at two power stations along the Ganges Canal and will be distributed through 156 miles of double-circuit transmission lines at 37,000 volts and 682 miles of single-circuit line. The total generating capacity will be about 4,000 kw. hydro power, with an oil reserve of 1,000 kw. The two power stations at Palra and Bhola and the structures for the transmission mains have been completed and partial supply is to be given to several towns which early this autumn were linked up by 300 miles of line.

M. S. Sloan Speaks for Industry*

THE community has come to be more than a mere political division, such as a city or state. The nation's industrial progress has forced us to recognize a community as being any territory whatever that has certain geographic, commercial, agricultural, economic, social or other characteristics that affect or govern the industrial progress of that territory.

* * * *

If there are evil conditions in the industry which we haven't cured or can't cure, any help we get from public authority will only benefit the industry in the long run.

But it would be unfortunate for the public, as well as utilities, if laws should be adopted or a condition of mind created which would hamper or prevent the legitimate economic development and progress in the economic set-up of utilities.

* * * *

We cannot expect public confidence from a few or many acts of superlative service. We must give continuous constant attention to the public interest.

One direct and definite thing we can do is to share with the consumer, in lowered rates, whatever savings and business benefits result from mergers and consolidations.

**Excerpts from Old Point Comfort address before Public Utilities Association of Virginia.*

Mechanism of
Dielectric Loss and Breakdown

By Dr. J. B. WHITEHEAD*
Chairman Committee on Electrical Insulation, National Research Council

A résumé of recent research on electrical insulation emphasizing the most definite aspects to ascertain the direction in which new knowledge is leading

THE most salient features of recent research in the field of electric insulation are the increasing study of the ionic character of the anomalous conductivity of dielectrics, the occurrence of space charges and the immediate bearing of these phenomena on dielectric loss and dielectric strength. I take it that we are all agreed that these are the most important properties of insulation, bearing in mind that dielectric loss has probably a greater bearing on life than any other property.

The importance of this type of research is best realized by recalling how long physicists and electrical engineers have held to the classical ideas of Faraday and Maxwell on the mechanism of dielectric behavior. Faraday conceived a dielectric without conductivity. Maxwell recognized dielectric conductivity but assumed it to be of the same type as that of conducting substances. He was able to explain dielectric absorption, residual charge and dielectric loss on this simple basis. This seems to have been the ground upon which physicists for the most part, until quite recently, have turned their backs on the anomalous properties of dielectrics, assuming every unexplained apparent conflict with Maxwell's assumption to be due to uncontrolled impurities. We are, however, now seeing increased evidence of the realization that this attitude is untenable, and doubtless, owing to the increasing demands of engineers in their use of dielectrics as insulators, we are witnessing an increasing attention to the study of dielectrics, not only by engineers but by those physicists and chemists who devote their chief attention to the uncovering of fundamental knowledge through research.

In our effort to arrive at a more definite viewpoint than heretofore, we may consider briefly our gradually increasing knowledge of the physical character of dielectric absorption and electric rupture or breakdown. The relation between dielectric absorption and dielectric loss is well known and, as has already been suggested, we must look to behavior as regards dielectric loss as one of the most important factors bearing on the question of life.

**Address before National Research Council committee on electrical insulation, at Massachusetts Institute of Technology.*

Let us consider some of the more conspicuous results obtained in the study of these two properties, as found in gases, liquids and solids, respectively.

GAS CHARACTERISTICS MORE DEFINITE THAN FOR LIQUIDS OR SOLIDS

Dielectric Absorption.—Gases under normal conditions have in general excellent insulating properties, their conductivity being extremely low. They are probably as pure materials as can be obtained from the standpoint of freedom of the influence of the impurities in electric study. They tend to show better than any other type of material the properties of the Faraday-Maxwell dielectric. They possess both specific inductive capacity and conductivity. The conductivity, however, is highly anomalous in character, as revealed in the well-known saturation current-voltage characteristic, with a final ascending portion indicating the approach to breakdown through secondary ionization. More important, however, is the fact shown by the results of Zeleny and others that gases under continuous potential show a fixed distribution of space charge and a consequent non-uniform potential gradient. We have evidence of a stable space separation of the ions and a resulting polarization of the gaseous dielectric. This indicates that the medium should show an initial decreasing current voltage relation, i.e., dielectric absorption, and also dielectric loss.

The absorption phenomenon, however, is of very brief duration, owing to the fact that gaseous ions have relatively high mobilities and the space charge separation takes place within a very short time. The influence of impurities in supplying new ions is relatively small. Residual discharge is absent because the oppositely charged ions reunite through the external circuit and also within the body of the material, constituting currents in opposite directions. Losses under alternating stress must also be present. Measurement of absorption or of loss would be difficult, owing to the brief duration of the former and the low value of the latter.

Breakdown.—Considering the conditions of the breakdown of gaseous insulators there is increasing evidence that the first steps in breakdown result from localized filaments of cumulative conductivity. Old examples are the common spark discharge, the streamers of brush discharge, the lightning discharge, etc. N. E. Dorsey has proposed a theory of the lightning stroke, which pictures a projectile of electrons of increasing intensity, which arises in the initial activity of a single electron, followed by progressive secondary ionization. More recently initial breakdown in gases in filamentary paths as due to secondary ionization has received additional evidence,

in the interesting photographic studies of Torok, in which the preliminary separate ionic paths of an arrested spark discharge are clearly shown.

The laws of breakdown in gases for all forms of electrodes are more definite than in liquids and solids, due to the uniformity of the medium and the freedom from impurities.

Liquid Dielectric Absorption from Accumulation of Space Charge

The general ionic character of electric conduction in liquids, i.e., the actual motion of matter as a carrier of electric charge, has been generally accepted since the early discussions of Helmholz and Arrhenius. It has been widely assumed that the conductivity observed in poorly conducting liquids, i.e., the so-called liquid insulators, partakes of the same general electrolytic character. Electrolytic conductivity may be traced down through an extended series of liquids of decreasing conductivity to the range of about 10^{-6} mhos per cubic centimeter. Below this, however, we find in many hydrocarbons values as low as 10^{-13} mhos per cubic centimeter, and indeed under the most careful conditions of purification values as low as 10^{-18} have been indicated. The conductivity of these extremely poor conductors is quite different from that of the electrolytes. Ohm's law is not obeyed; saturation currents, absorption phenomena and the influence of time appear. The nature of the ions involved in these phenomena are not known.

In insulation we are concerned with liquids of this type, and I call attention to the results of a few recent studies, and what they indicate:

Absorption.—Liquids, even of the poorly conducting class, have long been known to possess characteristics somewhat resembling those pertaining to dielectric absorption as observed in solids. Thus Warburg in 1895 records decreasing current with time under continuous potential, which he attributes to dissociated impurities. In 1908 G. Mie records an unequal potential gradient attendant upon the flow of continuous current and notes the probable presence of an unequal distribution of charge within the mass of the liquid. Similar results have been reported by others from time to time and the general behavior of liquids in these respects has been attributed to processes similar to those obtaining in gases as noted above.

More recently there has been a tendency to study these phenomena more closely with particular reference to the liquids ordinarily used in insulation. It has been found that in some cases the accumulation of space charge and the attendant unequal potential gradient or polarization are very conspicuous. Liquids of this type also frequently show saturation characteristics under long-continued continuous potential. An outstanding feature is the evidence of almost complete absence of any residual charge, even in those liquids for which there is a pronounced decaying charging current of the absorption type. This is one of the distinguishing characteristics of insulating liquids and indicates that there must be a pronounced difference between the type of absorption observed in solids and the apparently similar current on charge, as observed in liquids.

Absorption on charge, then, in liquids would be caused by the movement of ions, accumulating space charge, and so causing an increasing polarization emf. The ions move freely, but more slowly than in a gas, so that it becomes possible to observe the fall in the charging current with time. In carefully purified liquids these phenomena have been found to be in general accord with the laws of gaseous conduction. However, even in the best types of liquids used for insulation there is evidence of other forms of ions, which may arise in several causes, as, for example, solid impurities, large aggregates of molecules surrounding an electron, or electrolytic ions resulting from oxidation and organic acids. These ions are in general larger and slower and there is thus a wide range both in value and time-interval decay of the charging current. Owing to the relatively free motion of the ions in the liquid the absence of residual charge may again be explained as due to a recombination of the ions through the external circuit as well as within the liquid itself.

The high initial values of charging current have an immediate bearing on the value of dielectric loss under alternating stress. Thus it is highly important to consider an insulating liquid from the standpoint of the initial value of the charging current. The fact that most liquids are subject to simple modifications in this regard thus indicates the importance of the short time study of the continuous voltage charging current of these liquids. Under such study some liquids are apparently free from dielectric absorption, but even in such cases the dielectric loss under alternating stress increases more rapidly than can be computed from the observed conductivity under continuous stress. Consequently it must be assumed that initial absorption is still present, but disappears within intervals of time too short for study under the methods heretofore used.

Briefly, therefore, insulating liquids even in the most refined cases show dielectric absorption which, in part at least, can be explained by the accumulation of space charge, and its resulting counter or polarization emf. The absence of a residual charge has no bearing on the dielectric loss in the picture as presented. The loss is due to the oscillation under the alternating field of the ions present in the initial condition, which thus do not have time to move to the electrodes, but oscillate about one position, liberating energy by kinetic collision, or other type of friction with the material structure. Careful purification tends to reduce the absorption and loss, but complete elimination is never attained. Even should complete purity be reached, the oil would still possess an inherent conductivity, and under the laws of gases should still show the absorption phenomenon.

Breakdown.—A recent paper by W. Nikuradse on insulating oils shows a saturation voltage-current characteristic closely resembling that of the gases, namely, a current increasing first proportional to the voltage, then remaining constant over a range of voltage, and finally increasing more than proportional to the voltage, ultimately reaching breakdown. Curves showing a current increasing more rapidly than in proportion to the voltage have often been noted. It is now suggested that these are in reality a combination of a saturation characteristic of which the principal features are obscured by an extraneous conductivity.

The obvious suggestion of such results is that the breakdown of liquids is an instance of secondary ionization. Such ionization would naturally begin in localized filaments of the liquid in which, through some local impurities, or dissociated substances, or fiber, or air, or water drop, would give starting points. Evidence of these local weak spots have been observed by the writer in studies of the short-time continuous voltage character-

istics of insulating oil. Frequently in the initial condition the current curves show rapid and erratic irregularities, which are to be explained by a moderate acceleration of ions which is stopped at the end of limited paths by the adjacent portions of the liquid, as yet unimpaired.

The ions which are involved in starting this ionization would in the ideal case of a pure liquid be electrons, which, in accordance with the recent analysis of Smurow, in certain types of collision would be sufficient to liberate another electron from an atom, the outer orbits of the latter being already distorted to an unstable condition by the electric field. In the present state of the art of the refining of insulating liquids, however, it is more probable that the ions involved are larger and slower of movement, arising in dissociated impurities or oxidation products in the liquid itself. Finely suspended solid particles may also play a part. These may be pictured either as moving independently, forming new ions by collision, or as assembling in groups or clusters, thus constituting localized paths of high conductivity, and so increasing the stress in neighboring regions of the purer dielectric.

It will be recognized that the foregoing is generally in accord with the theory of liquid conduction and breakdown, proposed by Gunther-Schultz in 1923. His proposal is that under cumulative ionic motion sufficient heat is finally generated to vaporize a small portion of liquid and that gaseous ionization then begins at a very much more rapid rate, leading promptly to breakdown. The influence of pressure on raising, and of temperature on lowering, the breakdown voltage, and other observed phenomena are readily explained in terms of this theory.

Solid Dielectric Breakdown Possible from Secondary Ionization

Absorption.—Dielectric absorption is best exemplified in solid insulators. All substances show it to a greater or less extent. Moreover, all show residual charge, and in many cases the discharge curve differs from the charging curve only by a relatively small constant value of conduction current on charge.

Polarization emfs. have been suggested for solids for a long time. Curie reported values up to 200 volts for porcelain. Joffé up to 1,000 volts for quartz, and recently Von Seelen, 130 volts for rocksalt, after a charging potential of 400 volts. Corresponding inequalities of the potential gradient have indicated as necessary a distributed condition of space charge and a polarization quite different from the classical Faraday type. Even in crystals having the purest and most regular structure, as shown in the work of Joffé and others, we find evidence not only of the motion of ions but of motion restricted in such way as to lead to accumulated space charges, with resulting counter emfs.

Absorption in solids, therefore, is caused by the internal motion of ions restricted in their path by crystalline or other type rigidity of structure. Space charge accumulates at the ends of local conducting paths, further motion being limited by more perfectly insulating portions of the dielectric. Hence the space charge is distributed through the body of the material and in this respect differs from liquids and gases. Particular cases of these limited paths are the cleavages in crystals explaining the polarization observed by Joffé, and Böning's proposal of isolated regions of electrolytic conductivity leading to separation of ions and the accumulation of local space charge. Such local paths are especially evident in complex materials, as impregnated paper, where the contact of two different materials offers specially favorable conditions for the liberation of ions. Residual-charge and discharge-current curves closely resembling those on charge are explained by the fact that the recombination of charges on short circuit takes place entirely within the structure of the dielectric, as the separate charges cannot find a return path through the outside circuit.

Breakdown.—Considering the filaments of relatively high conductivity described in the foregoing paragraph, it is easy to see how the increased stress at the ends of these filaments, combined with the temperature rise due to losses under alternating stress, may lead to an extension of the lengths of the paths through the process of ionization by collision, and so to the small and clearly defined punctures often observed. Openings or other filamentary inequalities all contribute to this effect. In the case of crystals we have the remarkable analysis of Rogowski showing that in all probability the breakdown of crystals is due to secondary ionization arising in minute fissures in the structure of the crystal. Böning has also extended his theory of the separation of the electrolytic ions so as to lead to increased stresses and ultimate rupture. Still another recent contribution is an elaborate treatise by Smurow, who proposes that breakdown is due to secondary ionization resulting from the collision of electrons with atoms, the atoms themselves being already in unstable equilibrium as to their electron orbits, caused by the external electric field.

Basis for Future Procedure

Thus my proposal is that in large measure dielectric loss and rupture, as we know them in insulation, are supra-atomic rather than sub-atomic phenomena—phenomena involving molecular ions and aggregates, rather than the deeper lying relationships in the structures of the atom and the crystal lattice. That deeper lying causes of loss are present and contribute their share is true beyond question, but the best evidence is that this share is as yet unimportant beside the larger cause anomalous conduction. No satisfactory sub-atomic theory of dielectric absorption has as yet been proposed. Debye's theory of dipolar molecules, and their oscillation, cannot be invoked as an explanation of loss in the lower range of frequency, nor does it account for space charge and absorption. High values of contact difference of potential, high resistance, and other forms of double layers at the electrodes, are not clearly shown, cannot be explained and do not account for all observed phenomena.

What bearing has this picture on the problem of research in the field of insulation? As outlined in the committee's program,* it is addressed to both phases of the problem. First, there is a recognition that the dielectrics of insulating materials are as yet imperfectly controlled. We must learn how to control them, seek and regulate the causes of disturbance. But beyond this we must find those materials most resistant to these causes, most stable under ionizing agencies, strongest under electric stress and the structural reasons therefor. These latter problems call for the most fundamental type of knowledge and study. As our methods and materials improve the significance and influence of molecular and atomic structure will become more and more evident and more and more dominant in their importance. There should thus be no difficulty in seeing that our problem is not only of very practical character, but that fundamentally it also calls for all our resources of fundamental knowledge and skill in scientific research.

*See Electrical World, page 1047, November 23, 1929.

Will "Firm Bidding" Check the Price Cutting Evil?*

It should eliminate many of the worst features of a peculiar competition for which a certain class of purchasers themselves are responsible

By W. W. Nichols
Allis-Chalmers Manufacturing Company

FORTUNATELY for the present generation, business has taken the great step from competition to co-operation. Competition has been defined as "contention of two or more for the same object or for superiority." In this country it has been too often harmful rivalry in business and has led to legislation and restrictions which are still felt by business today.

One should not forget that restrictive legislation results from habitual abuses against the common welfare. The Supreme Court today puts interpretations on the Sherman anti-trust act which were never intended by its framers, a situation which is significant, since these interpretations obviously were in response to public demands. Undoubtedly the Sherman and Clayton acts were justifiable, and, to go a step farther, business was largely if not wholly responsible for the costly regulation by commissions which is the subject of considerable perplexity in business administration today. Undoubtedly the gradual decision of the group to adopt co-operative methods in place of purely competitive methods has been a strong factor in the business welfare of the United States.

The welfare of the individual commercially as elsewhere rests on the welfare of the group. A business leader who contributes his part to his industry thereby adds to his own welfare, and the converse is also true. Furthermore, the success of the merchandiser of goods is distinctly the concern of his purchaser as well, as we shall see later.

No One Benefits from Slashing Prices

One illustration of this is found in the question of price cutting. Needless cutting of prices invariably works to the ultimate disadvantage of the initiator of the reduction, who is not infrequently the purchaser (in the person of his agent or otherwise) of the commodity affected. When such an agent uses questionable methods for the purpose of reducing prices, he involuntarily inflicts upon his own interests the costly results of such action. When his methods happen to involve inaccuracies or misleading statements to achieve his purpose, he obtains valuable consideration by false pretenses, which he may overlook is a penal offense. Should he pit competing producers against one another in prosecuting his own ends he not only abets an offense against the public welfare but helps to degrade public morals, from the consequences of which he cannot altogether escape. Such acts are real economic offenses against the good taste and business probity of his group. The seller is usually the victim of such circumstances, but the strange thing is that originally the seller himself may have been the real instigator of the offense.

A distributor who accepts orders through which he incurs losses can remain in business only by carrying these losses to future orders. This he does, of course, by increasing his overhead charges, which must be passed on to his future estimates. Should an industry, such as the machinery industry, for example, not realize the profits its enterprise requires, it cannot make the progress often essential to the progress and prosperity of the customer. In other words, hard-driven bargains by the purchaser may force the distributor to lower the quality of his product, and the declining margin of profits not only prevents the development of the art, but chills initiative and reflects adversely on the purchaser's ultimate interest.

Must Rely on Business Executives to Correct Abuses

After all, we must rely on our business executive, who, comprehending the effect of abuses of this kind on the welfare of his own enterprise, will direct and support his purchasing agent in combating them. The peculiar status of the purchasing agent in sales negotiations makes him the essential factor in abandoning injurious practices, and without his co-operation nothing can be achieved. He is in a position to force the issue, and therefore becomes a keystone in the arch of our industrial stability. Naturally his judgment will be in conflict with his natural desires to reap temporary advantages. Finally, he can certainly trust *some* of his sellers to furnish the opportunities to resort to tactics which he seeks to abandon in the national interest, thereby protecting and promoting his own.

As a remedy for this price-cutting abuse, I have offered firm bidding, simple in itself, but difficult of application. Obviously, success can result only from an intelligent and far-seeing co-operation on the part of the two parties concerned, the seller and the buyer. I have suggested that purchasing agents generally, under executive approval, adopt and follow the practice, which some of them have already proved not only fair and equitable but which more than compensates for any individual losses they feel they might otherwise sustain. Purchasing agents already committed to the process advise me that firm bidding, in contradistinction to juggling bids, will yield all the benefits claimed for it.

**Abstracted from an address made recently at the executives' night meeting of the Purchasing Agents' Association of Chicago.*

One-Mile Vacuum Tunnel to Test Light Speed

WORK is progressing on the mile-long vacuum tunnel being built near Santa Ana, Calif., by Dr. Albert A. Michelson, Dr. F. G. Pease and associates of Mount Wilson Observatory to obtain a more accurate measurement of velocity of light. The first unit, 1,100 ft. long and 3 ft. in diameter, is reported to be almost completed.

This will serve for a preliminary test of the efficacy of the tube as a vacuum chamber. By using the vacuum tunnel, Dr. Michelson hopes to eliminate the atmospheric interference he encountered when he measured the speed of light between Mount Wilson and Mount Baldy, a distance of 23 miles.

The tunnel is being constructed of corrugated steel. A series of mirrors inside the tube will be shifted and adjusted by tiny motors, also on the inside, but controlled from the outside.

Full Speed Ahead

Say Business Leaders

Among the business leaders present at the White House conference called by President Hoover were: Julius Rosenwald, Henry Ford, Clarence M. Wooley, Walter Teagle, Owen D. Young, Matthew S. Sloan, E. G. Grace, Myron C. Taylor, Alfred P. Sloan, Jr., Pierre du Pont, Walter Gifford, S. W. Reyburn, J. I. Stroud, William Butterworth, E. J. Kulas, George Laughlin, A. W. Robertson, Redfield Proctor, P. H. Gadsden, E. T. Trigg, Henry M. Robinson and Julius Barnes.

THE farther one gets from Wall Street the less effect he will notice from the recent stock market episode. The percentage of people affected thereby, and consequently the total purchasing power of the country, is not affected more than 4 per cent.

* * *

There is no denying the fact that 1929 was an abnormal year and that 1930 business may be less, but it will follow the general upward trend of the business curve projected from the year 1924.

* * *

Seasonal trends must not be overlooked in judging current and future business, otherwise the blame may be placed on the stock market episode when it may not be the controlling influence. Furthermore, it must be remembered that all new industries undergo growing pains.

* * *

Although the 22 industrial leaders who conferred with President Hoover on Thursday, November 21, on the present business situation and its future spoke frankly and did not try to evade realities, virtually every one was optimistic regarding the future.

* * *

None of these industrial leaders will cut wages, according to promises made, and Henry Ford promises to raise them to maintain purchasing power.

Small businesses should be relieved of uncertainty regarding the future at the earliest possible date and given encouragement by their banks in the form of cheaper money. This attitude will undoubtedly be supported by the Federal Reserve system.

* * *

This period is a real test of installment selling, yet the head of one company which depends almost entirely on installment payments reports that promptness of payments has not suffered.

* * *

Exports are needed now more than ever as a stabilizer and may be expected to be accentuated in the next six or eight months. However, exports should not be planned on the former basis of dumping surplus and dropping the market later, but rather on more solid ground involving the development of new lines or fields of activity.

* * *

In the opinion of the 22 industrial leaders this is emphatically *not* the time to cut down analyses of markets and appeals to trade.

* * *

Loose reference to industries as luxury industries should be avoided without being certain they are luxuries.

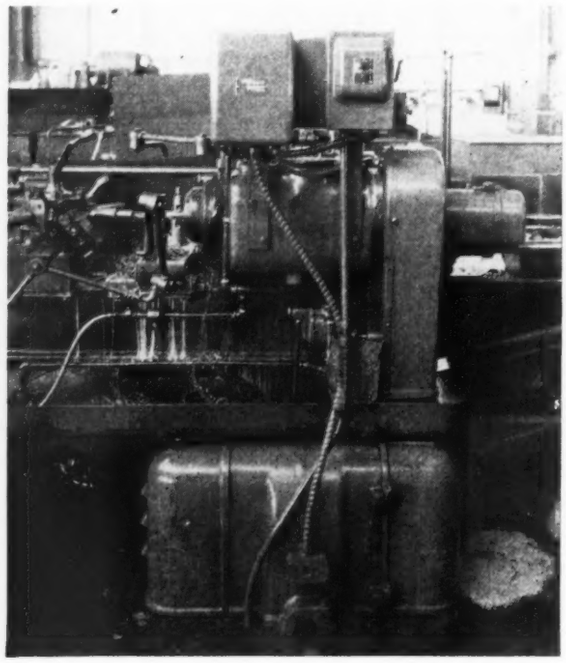
* * *

More calm sobriety and less loose talk is needed.

Production Speeded by Improved Lathe Control

By H. H. Watson
Industrial Control Engineering Department, General Electric Company

THE use of a magnetic controller involving time-acceleration and push-button operation for starting and stopping has proved a valuable production aid in lathe work involving quantity production where automatic screw machines are not justified. The Warner & Swasey Company No. 4-12 speed all-geared head turret lathe illustrated is used at the Schenectady works of the General Electric Company and is representative of an up-to-date installation of electrical equipment in which the 3-hp., 1,150-r.p.m., 230-volt shunt-wound direct-current motor is mounted in the base of the lathe protected by the cast-iron housing. The starter, a magnetic controller using time acceleration, is located up above the lathe at the back. The push button for operating the lathe is located at the front, where it is within the reach of the operator at all times.



Lathe Control for "Multi-Head" Machine

Portable Telephone Speeds Conductor Stringing

IT IS a common sight in tower line construction to see men standing on the tops of towers relaying signals to the pulling point as the conductor sag is being adjusted. But if a comparatively long section of line is being pulled up in one operation or in rough country, this method of signaling from span to span may become very expensive and even entail costly delays. For instance, the experience has frequently occurred that one signalman while waiting for a signal has become so rapt in contemplation of the panorama spread out below him or has indulged in introspective reflection to such a degree that he failed to notice the man on the next tower frantically "wigwagging" signals until frenzied shouts from the foreman below brought him back to consciousness of his duties.

This human difficulty has been eliminated and the sagging operation greatly speeded up as a result on major construction jobs handled by the Hoosier Engineering Company by the use of a portable telephone set. The man sighting the sag is equipped with a transmitter and receiver, as is also the man who is directing the pull. One side of the telephone line is temporarily clipped to the conductor that is being pulled up and the other side is grounded at the two terminal points. By this means the man at the transit can talk directly to the man at the pulling tackle, so no time is lost in communication and the sag is more quickly and readily adjusted.

Calculation of Furnace for Mixed Brass Annealing

ASSUME a brass mill having brass in miscellaneous size coils, bars, etc., to be annealed and that the pan type furnace is to be used.

Assumed data:
1. Weight of charge, 8,000 lb. of brass.
2. Temperature, 1,100 deg. F.
3. Weight of pans, 850 lb.
4. Total time for proper anneal, 1½ hours.
5. Size of furnace, 6 ft. 6 in. wide by 17 ft. long by 2 ft. 6 in. high door opening.
6. Furnace to be operated 24 hours per day.

Absorption of Charge:

$$\frac{8{,}000 \times 0.105 \times 1{,}030}{3{,}412} = 252 \text{ kw.-hr.}$$

Absorption of Pans:

$$\frac{850 \times 0.14 \times 1{,}030}{3{,}412} = 36 \text{ kw.-hr.}$$

Standby losses:
Inside area of furnace, 375 sq.ft.
Therefore:

$$\frac{375 \times 1{,}100}{10{,}000} = 41 \text{ kw.-hr. per hour.}$$

Summary of Heat Requirements

	Kw.-Hr.
Absorption of charge	252
Absorption of pans	36
Losses for 1½ hr. 1½x41	62
Total power consumption per charge	350

Economy:

$$\frac{8{,}000 \text{ lb.}}{350} = 23 \text{ lb. net per kw.-hr.}$$

Rating of furnace:

$$\frac{252 + 36}{1\frac{1}{2}} + 41 = 233 \text{ kw.}$$

Since most of the heat absorbed by the charge must be supplied during the first part of the cycle, the rating of the furnace must be somewhat higher than as determined above. The rating of this furnace should be about 300 kw.

In actual operation a 300-kw. furnace operating on 67- and 68-minute anneals at temperatures of 1,000 to 1,100 deg. F. handled from 4,600 to 7,470 lb. of brass product on pans weighing from 540 to 850 lb. with total kilowatt-hour consumptions of from 230 to 294. The economy in pounds of brass per kilowatt-hour ranged from 20 to 25.4.

**As indicated in a paper, "Calculation and Operating Costs of Electric Furnaces," presented by R. M. Cherry of the General Electric Company at the Industrial Electric Heating School, Case School of Applied Science, Cleveland, Ohio.*

Letters from Our Readers

Short Time Ratings of Oil Breakers

To the Editor of the ELECTRICAL WORLD:

I agree with the statements and inferences in the opening paragraph of your editorial on this subject—that the operating man must know, among other things, the following in order properly to apply an oil circuit breaker:

1. The interrupting rating of the breaker.
2. That it is mechanically and electrically strong enough to withstand the first impact of a short circuit before it opens.
3. The period of time that the breaker will stand up if the opening time is delayed, purposely or through some defect.

The General Electric Company in its oil circuit breaker ratings and in the explanation of these ratings gives all of this information. Our interrupting tables* give one second and five second ratings for all our oil circuit breakers. In addition, our published literature contains the following statement† which settles the practice regarding item 2 above:

> *Greatest Current Capacity.*—Oil circuit breakers are not only required to interrupt the short-circuit current but must also be able to withstand the maximum heating and magnetic stresses imposed.
>
> The maximum initial r.m.s. current as determined from Table IX at initial rush must not exceed the one second short time current rating of the breaker. Furthermore, the current which the breaker is required to carry must not exceed the one and five second ratings for these respective time intervals.

If there is any cloud of uncertainty in the application of breakers, it is because the published literature on the subject has not been studied. In order to assist in clarifying this question I will discuss a few of the points relating to the application of oil circuit breakers.

It is the primary purpose of the manufacturer to give ratings. The information supplementing these ratings, such as decrement curves of short circuits, is supplementary data to be used to the extent that they apply to the job on hand in determining the amount of short-circuit current to which the oil circuit breaker manufacturer's ratings should apply.

These decrement curves are based on certain assumptions, namely:

1. Transient characteristics, determined from oscillograph tests on alternators of normal design.
2. That the effect of capacitance and resistance in the impedance is neglected..
3. That the contact resistance at the point of the short circuit is zero.
4. That previous to short circuit the alternator is carrying full load at 80 per cent power factor.
5. That the short circuit is established at the point of the pressure wave corresponding to maximum possible instantaneous current.
6. That no automatic voltage regulators are used.
7. All reactance up to and including 15 per cent is considered within the alternator. For values of reactance greater than 15 per cent, all reactance in excess of 15 per cent is considered as external.

The necessity of discounting low-voltage high-current ratings discussed in the editorial is entirely one of determining the short-circuit current that will flow in a particular circuit. The reason that some discounting of the decrement curve short-circuit current values may be required is that the assumptions on which the decrement curves were based neglect the effect of resistance. On certain 2,300-volt circuits the effect of resistance may be appreciable in reducing the amount of short-circuit current and it therefore should not be neglected if an economical application of the oil circuit breaker is to be made.

How much the decrement curve values of current may be safely discounted may be determined by calculation, but this is a laborious process. Some engineers who have calculated a number of such circuits and have made tests on such circuits have been able to judge with reasonable safety the amount of discount to be applied.

Inasmuch as oil circuit breakers are rated on an OCO basis, it must also be assumed that they are capable of closing a short circuit equal to the one second rating. The one second current rating includes the effect of both heating and electromagnetic forces. Whichever of the two values is the smaller of course determines the rating. It is considered of little use to the person making the breaker application to know which of the two factors, heating or electromagnetic forces, is the limiting value so long as a limit is given. As a matter of interest, where the one second and five second ratings are the same it is obvious that the electromagnetic forces or the amount of current that may be closed by the breaker are the limiting features.

R. M. SPURCK,
Engineering Department.
General Electric Company,
Philadelphia, Pa.

*Bulletin 47418-B, pages 31 to 38. † Bulletin 47418-B, page 23.

Danger of Ground Chains Not Under Tension

To the Editor of the ELECTRICAL WORLD:

In the November 2 issue of the ELECTRICAL WORLD there appeared a short article on the use of a reel to store the ground chain on the linemen's truck and the statement was made that the chain was wound onto the reel beginning in the middle and that only as much chain as needed is unreeled.

In the interest of safety I wish to call your attention to conditions presented in this arrangement which have been proved unsafe, both by test and field experience. I have reference to the fact that unless a ground chain is put under at least a 20-lb. strain a series of air gaps is formed between links, preventing such a chain, particularly on weatherproof insulated transmission lines, from actually grounding same.

A specific instance comes to my mind wherein the wrong 22,000-volt line was ordered out of service to replace a pin type insulator. A ground chain was pulled over the conductors by a hand line and the conductor removed from the insulator and replaced on a new one. It was not until the linemen started removing the ground chain that it sawed through the weatherproof insulation, creating a short circuit and grounding the line, so the entire process had been carried out on an energized line without protection. Fortunately no one was injured.

I believe that the investigation to which I have referred indicated also that galvanized chain, such as used on arc lights, should not be used because of poor contact between the links and that copper-plated chain was recommended rather than solid copper as it reduced the investment.

Please accept this not as criticism but in the interest of safety, as there is a possibility that the small operating companies may adopt the arrangement you described without investigation.

P. W. EBERHARDT,
Manager Electrical Division.
Walter Kidde & Company, Inc.
New York City.

Digest of Foreign Literature

Generation, Control, Switching and Protection

Present Status of Lightning Protection.—A. MATHIAS.—Several years ago a lightning committee was formed in Germany to investigate theoretically, in the laboratory and in the field, phenomena which are directly or indirectly connected with natural lightning. Available data were collected and critically examined to test their validity in the light of modern acceptances. Currents in the main bolt have been established as lying between 10,000 and 50,000 amp. As many as 42 partial discharges were observed on one bolt, with a duration of 0.5 to 20 microseconds each and as much as 0.3 second between them. This accounts for durations of as much as one second for one complete discharge. Cases are on record where one complete discharge apparently covered an area of one square kilometer. Complete records were obtained in the field by the use of a seven-element oscillograph which records on one strip electric and magnetic actions, a timing wave and a sound track of the thunder noise. Based upon the outcome of carefully investigated faults, the author accepts that almost all known cases of punctures or flashovers are caused by direct hits of lines or towers, while alleged secondary or inductive faults on lines, due to a bolt striking nearby, are questionable. Characteristics of traveling waves seem to prove the author's assumption. — *Elektrotechnische Zeitschrift*, October 10, 1929.

Short-Circuit Tests on Breakers in Field.—K. BERGER and H. HABICH.—At the end of a 135-mile stretch of the 132-kv. Swiss national single-phase railway bus short-circuit tests were made to investigate the performance of circuit breakers. Steep front waves, which were liberated when the short was opened, greatly handicapped the performance of the switch due to the "slowness" of the arc. To study the transient phenomena in these tests, a loop oscillograph was found too slow. Arrangements were therefore made to record the phenomena with a loop oscillograph for the general character of the make and break, and simultaneously with a cathode-ray oscillograph to obtain even the finest details. Eight of these double records are reproduced, giving a most excellent picture of these involved and rarely studied problems. It seems that under not unusual short-circuit conditions overvoltages of twice to four times line voltage appear, which may and actually have caused bushing flashovers. The authors point out that breakers in the field are frequently called upon to perform rupturing duties far more severe than those made by the manufacturer in his high power testing laboratories. Field tests have shown, for example, that a breaker labored hard opening 20,000 kva. at the end of a long line, while the same breaker ruptured easily 300,000 kva. at the factory. Laboratory tests will always be the most valuable comparison tests to establish mechanical and electrical design principles of breakers, but whether a certain breaker is suitable for a particular duty in a line or network can only be definitely established by the customer's tests in his network.—*Bulletin de l'Association Suisse des Electriciens*, October 22, 1929.

Transmission, Substations and Distribution

Simultaneous Transmission of Three-phase and Single-phase Current.—E. JACOB.—In several European countries single-phase 16⅔-cycle traction system and 50-cycle general light and power supply have been standardized. This requires not only a double set of generators but also two sets of transmission lines. Some time ago the author advanced the suggestion to superimpose these two currents and to transmit their combination over one common three-phase line with an additional fourth conductor. With a specially designed Y-series transformer at the sending and receiving end, the two frequencies, which are of the ratio 1 to 3, can be combined and again separated, without influencing each other in the least. A number of wiring diagrams give typical examples of such double frequency transmissions. Cost comparisons indicate that savings of about 25 per cent may be expected from the use of this method. It seems, however, that the full economy of this type of combined transmission can only be realized for long-distance lines.—*Bulletin de l'Association Suisse des Electriciens*, October 7, 1929.

Most Efficient Size of Cable Conductor—C. G. WATSON.—The author has outlined some important considerations arising in the design of a low-tension distribution system for heavy loads. In order to approach the subject logically it has been considered necessary to investigate the effective resistance of a conductor, the economic current and the most efficient size. Distribution involving one or more cables has been considered in detail. As the result of a considerable mathematical investigation it has been concluded that under certain conditions it may be economical, apart altogether from mechanical considerations, to lay two or more cables in parallel in one trench to carry the same load. That is to say, when the total current to be carried exceeds a certain limit, two or more cables of the same size, each carrying its proper proportion of the load, should be laid together. Efficiency data to substantiate the reasoning on which these conclusions are based have been offered by the author in this discussion.—*Electrician (England)*, October 25, 1929.

Units, Measurements and Instruments

Remote Measurements.—G. KEINATH.—Present-day decentralization of power generation with centralized dispatcher accounts for a steadily growing demand for remote indication and measurements. Momentary values of voltage, current, phase angle, frequency, pressure and water level, remote metering, integration of momentary values and remote recording of any of these values represent the wide zone of modern requirements. Transmission distances may vary from a few yards up to 800 miles. The channel of transmission may be the power line itself, a private telephone line or a pair of conductors in the public telephone or telegraph system. Mutual interferences must, of course, be carefully avoided. Since only one pair of conductors are available for the channel, a simultaneous transmission of a number of values must be possible. The accuracy of transmission may vary from 5 per cent to a fraction of 1 per cent. The author gives a general review of this vast and complex field, emphasizing in particular latest developments of remote metering.—*Elektrotechnische Zeitschrift*, October 17, 1929.

Motors and Control

Hysteresis Starter for Induction Motors.—W. T. KASSJANOFF.—For the simple starting of a three-phase induction motor with wound armature and three collector rings, the author recommends a small three-phase iron core reactor to be permanently connected to the brushes on the slip rings. The stator of the motor is then simply thrown directly on the line. With the rotor at a standstill or just beginning to revolve the full or nearly the full line frequency flows through the reactor, introducing a large reactance into the rotor circuits. As the speed increases, this frequency becomes lower and lower, offering less and less reactance, until at full speed only slip frequency of 2 or 3 cycles causes the reactor to be almost equivalent to a short circuit. The author offers the complete theory of this auto-starter, data for the correct design of the reactor, and practical examples of calculations, given iron weight, copper weight and performance curves.—*Elektrotechnik und Maschinenbau*, October 6 and 13, 1929.

Electrophysics, Electrochemistry and Batteries

Electric Conduction in Stable Coarse Suspension. — SAKUJI KOMAGATA. — Electric conduction in stable coarse suspension differs, according to the author, considerably from that in an ordinary electrolytic solution, its effect becoming more marked with the increase of strength of the electrical double layer. This difference is said to be due mainly to cataphoresis and has a close relation with the mechanism of electric conduction. The author has established this mechanism and verified it by a number of experimental observations. These involve potential distribution, residual charges, current-time relation, thickness of deposition, and alternating-current conduction. The experiments indicate: that the potential gradient near the electrodes of the opposite sign of the disperse phase decreases with time; that the voltage appears between the two points in suspension in the opposite direction to that in the polarization current after the switch is opened; that the total current increases with the increase of time in a far greater degree than that due to the temperature rise only, and that the alternating-current conductivity of suspension which consists of equal amount of electrolyte and different amounts of disperse phase becomes a minimum when the deflocculation is a maximum. —No. 267 *Researches of the Electrotechnical Laboratory (Japan)*, 1929.

Miscellaneous

Scenic Effects by Projection.—P. PLANER.—A description of what is claimed to be an entirely novel method of theatrical stage effects, produced by powerful electric projection lanterns. Instead of large and expensive painted backdrops, several European theaters have adopted the author's method of producing the desired background from a 5x7-in. size lantern slide, projected upon a white backdrop. To execute this seemingly simple method a great number of difficulties had to be overcome. Since an installation of the lantern is impossible directly in front of the stage, projection from above, under about 45 deg. downward, is necessary. To avoid bad distortion of the image, the original artist's sketch has to be copied upon the lantern slide under reverse distorted position, resulting in a perfectly true image of up to 1,500 sq.ft. size. On account of this large size, an arc lamp of 100 amp. is used, requiring particular provisions, such as a magnetic blow field, to prevent the reflecting mirror from damage due to the 45 deg. inclination of the lamp. The excessive heat of the arc required a special glass for the condenser and an air cooling of the slide to prevent its cracking during acts lasting as long as one hour. A similar method of projection has been used successfully for outdoor advertising, in which case a special screen is used, consisting of a vast number of small square plates, hung up on horizontal wires. From a distance such an arrangement has the appearance of a solid surface. Each of the plates has a small horizontal lip, acting as a shade against daylight from above.—*Elektrotechnik und Maschinenbau*, September 8, 1929.

Book Reviews

Foreign Securities

By John T. Madden and Marcus Nadler. New York: The Ronald Press Company. 452 pages.

"Foreign Securities" is exceedingly timely in view of the increasing interest being taken by American institutions and private investors in foreign securities. The investment trusts, for example, are in many cases seeking to diversify, by including in their portfolio the most attractive foreign interests with which they are familiar. Normally, there is little accurate information readily available, unless definite sources are known. This publication points out such sources and goes into a lengthy discussion of the financial, legal and political factors affecting the securities in the various countries.

A feature is made of mortgage banking in international finance, a subject on which little that is authentic has been written of late. Such other subjects are covered as the international money market and the international capital markets, the methods of underwriting foreign government loans, internal and external foreign loan control, etc.

Municipal Ownership

The Changing Character and Extent of Municipal Ownership in the Electric Light and Power Industry. By Herbert B. Dorau. Chicago: Institute for Research in Land Economics and Public Utilities. 102 pages, 34 charts. Price, $1.50.

It may safely be said that no statistical study of the subject has ever been made before approaching in thoroughness the one of which the results are set forth in this book. The author states that between 600 and 700 volumes were examined, a voluminous correspondence was carred on to ascertain the history, year by year, of each plant during the entire 45 years from 1882 to 1927, and that this task engaged the work of a sizable clerical staff for the better part of three years. In this exhaustive search hundreds of establishments came under scrutiny that not even the careful survey of the quinquennial U. S. Census succeeded in bringing to light. Thus, the latter disclosed 2,192 in 1927, 2,581 in 1922, 2,318 in 1917; the new research gives 2,320, 3,014 and 2,411 such establishments as being in existence at the ends of the same years. In all, 3,814 were traced, the cumulative number of establishments originating during the whole period, so far as could be ascertained.

The present report is preliminary to a larger study to be published later. It aims only to record the data as discovered, with little or no attempt to assign causes, and is therefore entirely free from any controversial aspect on a subject that, it must be admitted, has on occasion been discussed with considerable spirit.

Experimental Radio

By R. R. Ramsey. Bloomington, Ind.: R. R. Ramsey. 255 pages, illustrated.

In preparing the third edition of his book of radio fundamentals the author has wisely confined his attention to a relatively simple exposition of experiments which clearly and accurately indicate basic facts. The layman and the everyday worker will find this volume of ever-useful interest. Specially planned for the radio public, college, commercial and amateur, everything to which one might reasonably care to have reference appears in orderly precision—testing batteries, tubes, transformers, condensers; measurement of all essential equipment characteristics; construction of parts, sets, hook-ups and receivers, and characteristics of radio apparatus from dry cells to television. The expressed intent has been to place the discussion on a par with any second year course in physics, and those thousands who are interested in radio, but who are neither highly trained technicians nor theorists, should welcome this volume.

Book Note

LA PRODUZIONE E L'IMPIEGO DELL'ENERGIA IN ITALIA NELL'ANNATA, 1928. By Ing. Ettore Cesari. Milan: Arti Grafiche E. Calamandrei & Company. 50 pages, 53 tables, seventeen charts.

It suffices to say that this compilation gives official statistics not only for the electric light and power industry but for manufacturing as well. There is much valuable detail; for example, one table shows the production per kilowatt-hour in each of many industries and the ratio of cost of energy to value of product. The author is director of the National Fascist Electrical Industry Union of Italy.

Books Received

Heaviside's Operational Calculus. By Ernst Jules Berg. New York: McGraw-Hill Book Company, Inc. 208 pages. Price, $3.

Electric Street Lighting. By Charles J. Stahl, E.E. New York: John Wiley & Sons. 223 pages, illustrated. Price, $3.50.

Electromagnetic Problems in Electrical Engineering. By B. Hague. London: Oxford University Press. 352 pages, illustrated. 30s. net.

Theory and Design of Electrical Machines. By F. Creedy. New York: Isaac Pitman & Sons. 346 pages, illustrated. Price, $9.

News of the Industry

Public Utility Leaders with President

Electric Light and Power, Street Railway and Gas Executives Discuss Business Outlook—Aggregate Budgets in 1930 Will Exceed $1,500,000,000

IN RESPONSE to a call from President Hoover, about thirty prominent executives of electric light and power, electric railway and gas companies were in conference with him at the White House on Wednesday as the ELECTRICAL WORLD closed its forms, the holiday on Thursday having necessitated advancing press day. Some concerted announcement of plans for maintaining or increasing construction enterprise and ranging the industry squarely in line with the President's efforts to stabilize business is likely to result and will be reported amply next week. The meeting forms a fourth in the series of business conferences called by the President, which had previously included steam railroad men, industrial and manufacturing chiefs and agriculturists.

A list of the men who were to see the President was given out at the White House as follows: Owen D. Young, Samuel Insull, S. Z. Mitchell, Charles L. Edgar, Frederick L. Dame, W. A. Jones, B. C. Cobb, Thomas N. McCarter, C. E. Groesbeck, Halford Erickson, George N. Tidd, John E. Zimmermann, P. G. Gossler, W. W. Freeman, George B. Cortelyou, John B. Miller, Floyd L. Carlisle, Herbert A. Wagner, M. S. Sloan, S. P. Hulswit, G. H. Clifford, Paul S. Clapp, P. H. Gadsden and B. J. Mullaney, representing electric and gas interests, and J. N. Shanahan, J. P. Barnes, Guy A. Richardson, J. H. Hanna, P. E. Paige, L. E. Storrs and N. A. Draper, representing the electric railway industry.

While the figures that will be laid before the President as indicating the size of utility construction budgets for 1930 are not available at this writing, it is announced that light and power, gas and railway expenditures will be in excess of a billion and a half. Of this sum, as already announced by President Sloan of the N.E.L.A., $850,000,000 will be spent by electric light and power companies. Items already made public include, besides the United Gas Improvement Company's budget of nearly $41,000,000, recorded last week, figures of between $75,000,000 and $80,000,000 for the Commonwealth & Southern Corporation, of more than $63,700,000 for the Standard Gas & Electric Company and of about $60,000,000 for the Utilities Power & Light Corporation. The Consolidated Gas, Electric Light & Power Company of Baltimore will appropriate $7,500,000, an increase of $600,000 over 1928, and the Syracuse Lighting Company announces a budget of "several millions"—two typical instances of operating-company plans.

Trade Commission Ready for Interstate Energy Inquiry

Inquiry into practices and conditions relating to transmission of electrical energy in interstate commerce will be undertaken immediately by the Federal Trade Commission in response to Senate Resolution 151, introduced by Senator Couzens of Michigan. The matter has been assigned to the commission's chief economist for investigation and report to the commission. The purport of the resolution, which calls for statistics on the amount of energy thus transmitted within 30 days after its passage (November 8) and at least once in every 90 days thereafter, was given in the ELECTRICAL WORLD for November 16 (page 996).

Navy Asks Puget Sound Power Pool as Condition of Aid

Secretary of the Navy Adams said on Tuesday that his department will not consider a request for the use of the airplane carrier *Lexington* as a power-generating auxiliary for Seattle and Tacoma unless the municipal plants of those cities and all other power-producing companies in the Puget Sound district get together, pool interests and cut consumption to the bone.

President A. W. Leonard of the Puget Sound Power & Light Company wired Congressman Albert Johnson that his company has no objection to the use of the *Lexington* by the municipal lighting departments of Seattle and Tacoma. The Tacoma *News-Tribune* says that the refusal of the Puget Sound Power & Light Company to co-operate with Tacoma in the present emergency will result in a hostile attitude on the part of its citizens when the power franchise expiring on June 1 next is voted upon in the spring. In the meantime, while the *Lexington* in Puget Sound waters awaits orders from the Navy Department, the Seattle and Tacoma lighting departments are making efforts to obtain auxiliary power from local industrial plants and are inaugurating a curtailment program by cutting down ornamental street lighting. It is now declared that Tacoma must curtail one-fourth of its output, reducing its consumption from 800,000 kw.-hr. to 600,000 kw.-hr. daily.

Insull on Regulation

Chicago Utility Chief Stands for "Expansive" but Not "Restrictive" State Control, He Tells Large Radio Audience—Alludes to Popular "Bugaboos"

SPEAKING from Chicago to a nation-wide audience through the National Broadcasting System on Sunday night, Samuel Insull, head of the Insull utility interests with their wide ramifications, declared himself to be heartily for proper regulation of public utilities by the individual states, but drew a distinction between different kinds of regulation.

"Long before necessity compelled the industry to accept government regulation I was for it," he asserted. "I was a consistent and persistent advocate of both the right and the duty of the state to regulate the quality and the rates of service and to control the capitalization of public utilities.

"Governmental regulation is the logical complement of private ownership and operation; it is essential to the welfare of the three parties in interest—users, employees and owners. But government regulation can be either expansive or restrictive.

"By 'expansive' I mean such laws and administration of law as will tend to the establishment of confidence among the three parties in interest; regulation which will convince users that the service is reliable, the rates reasonable; which will convince employees that their employment will be continuous, their wages good, their working conditions favorable; which will assure owners that their investments will be sound and the return fair and dependable."

Mr. Insull defined "restrictive" regulation as that which tends to spread distrust among the three parties. Such laws, he said, were predicated on the theory that the entire utility business was founded on "special privilege," when, as a matter of fact, "its basis is one of obligations." He admitted that because of the rapid growth of the utility industry it was inevitable and perhaps advisable that some persons should advocate restrictive measures. He compared the opposition of such persons with that of the devil's advocate and placed in the category of non-existent "bugaboos" the "power trust," the alleged constant effort by utilities to increase their rates and the idea that they earn dividends on watered stocks.

"I believe that adherence to an expansive policy of state control will

enable the industry to encourage invention, foster improved methods and promote economies in production which will maintain a continuing downward trend in rates, and thereby make available the benefits of the utilities' services to the most remote in distance and the poorest in purse throughout the land."

Says Public Mind Turns to Municipal Ownership

Massachusetts Commissioner Also Holds that "Going Concern" and "Reproduction New" Theories Conflict—New York Commission and Brooklyn Edison Merger Attacked

WHEN the legislative commission engaged in investigating New York State's Public Service Commission law reassembled on Thursday, November 21, Louis Goldberg, a member of the Massachusetts commission, completed his testimony, of which the first portion was mentioned last week (page 1044). Mr. Goldberg criticised utilities for including both "going concern value" and "reproduction cost new" in their valuation claims, saying that if one claim were allowed the other could not logically be entertained. He said also that, in his opinion, there was a growing tendency on the part of the public throughout the country to consider the advisability of municipal ownership of public utilities as an alternative to regulation.

The valuation plan submitted by Chairman William A. Prendergast of the New York commission would, according to Mr. Goldberg, give the utilities the benefit of every increase in commodity prices bring and the public no benefit.

As counsel for the Utility Consumers' League of New York, Maurice Hotchner presented a proposed program to revise the Public Service Commission law. This program was based largely on the plan presented to the investigating commission by Dr. John Bauer, a valuation expert. It also contained a provision for financing regulation by special assessments against the utilities.

On the following day Cornelius M. Sheehan, who was a New York City official under Mayor Hylan and is now active in several civic and consumers' organizations, attacked the Public Service Commission, charging that it had refused to admit the testimony of qualified witnesses in rate and service cases on the ground that they were not experts, that it had permitted gas companies to water their stock, that it had permitted individual commissioners to sit in cases where they should have been disqualified for some reason or other, and that it had refused to compel gas companies to supply gas of legal standard.

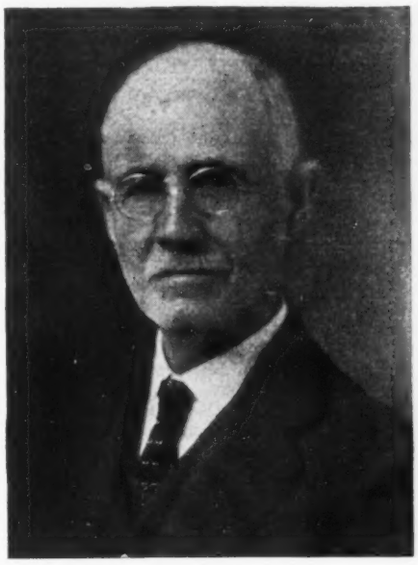
Joseph B. Milgrim, secretary of the Utility Consumers' League, recommended that the statute relating to publicity for proposed rate changes be revised in order to compel utilities to advertise proposed rate changes in the daily press at least two months before the changes are intended to take effect.

The investigators reassembled on Monday, when they heard Morris L. Ernst, counsel for the Public Committee on Power, which sought ineffectually to get its views on the Consolided Gas-Brooklyn Edison merger before the Public Service Commission in 1928, Governor Smith's request that the committee's representatives be heard being refused by a divided vote. Mr. Ernst charged on Monday that the merger was rushed through without adequate examination and that Chairman Prendergast permitted counsel for the Consolidated Gas Company to "run the hearing." Mr. Ernst urged legislation to make the right of the public to be heard in such proceedings mandatory.

The Long Island Lighting Company case (referred to last week) came up again, and Harry Larsen, the utility's commercial manager for Nassau County, admitted that he, in company with an attorney to whom $100 was subsequently paid, had persuaded petitioners for lower rates to withdraw their signatures until the number remaining was under the legal quota. When a second petition was filed it was met in the same way. The company's arguments, Mr. Larsen said, were that its profits were devoted to expansion and that a voluntary reduction would soon be made.

At Tuesday's session—after which the hearings were adjourned until the call of Senator Knight, the investigating committee chairman—the topic to the fore was submetering. Representatives of the owners of apartment houses and office buildings and of submetering companies in New York City gave testimony to the effect that the abolition of submetering as sought by the New York Edison Company would lead to the widespread installation of individual generating plants and declared that it would make it impossible for the utility company—against which imputations of bad faith were made—to reduce its rates. A report of the testimony at this hearing will be printed next week.

Honor Pioneer Power Man



William P. Lay

LAST Saturday, November 23, in the presence of prominent state officials and a large throng of citizens, the Alabama Power Company's hydro-electric development at Lock 12 on the Coosa River was the scene of a ceremony at which the name of "Lay Dam" was given to the structure in honor of Captain William Patrick Lay, founder and first president of the company, to whose energy and foresight the dam, which marked the beginning of hydro-electric development in Alabama, was due. Matthew S. Sloan of New York, a former Alabamian, made the chief address, paying a tribute to Captain Lay as one whose work in organizing the Alabama Power Company and contributing to the successful financing and building of the dam and plant brought about a new era in the history of the state.

Senator Nye Raises Alarm

North Dakotan Fears Alleged Move, Inspired by "Power Trust," to Transfer Accounting Activities of Power Commission to Departments

OPPOSITION to any move to transfer the accounting activities of the Federal Power Commission to any of the government departments was registered by Senator Nye of North Dakota in a prepared statement issued by him on November 27. Senator Nye has received the impression that F. E. Bonner, executive secretary of the Federal Power Commission, intends to transfer a large part of the accounting work of the commission to the Departments of War, the Interior and Agriculture. In his statement Senator Nye makes the accusation that the power companies advocated such a transfer of accounting activities last summer in a confidential memorandum. He charges that the purpose of this memorandum was to undermine the accounting efficiency of the commission and "transfer millions of dollars from the pockets of the public to the stock dividends of the power trust."

Despite the fact that the commission is handicapped in its work because it only has six accountants on its staff, Senator Nye thinks that much has been accomplished. He points out that it seems preposterous that the Federal Power Commission, which must cover the whole country, should be so limited in its accounting force when the New York Public Service Commission has thirty accountants with sixteen assistants and executives.

Because he thinks it inconceivable that Secretary of the Interior Wilbur could approve such a transfer of the commission's accounting activities, Senator Nye intends to confer with the Secretary at an early date. He has also announced his intention of taking the matter up with the commission's chief accountant, Mr. King.

Today's Outlook for Hydro Electricity

Federal Power Commission's Annual Report Shows that Drought and Other Handicaps Prevent Any Gain Compared with Steam Generation—For State, Not Federal, Regulation

RANGING a little distance from its strict field into a wider territory, the annual report of the Federal Power Commission, made public on Monday last by Secretary of the Interior Wilbur, the acting chairman, dwells on the continued expansion of the electrical industry, asserting that energy production in 1929 will establish a new high record and that a vast construction program must be undertaken to provide the new generating facilities required for the rapidly increasing demand. The proportion of energy generated by water power will, however, the report says, be sharply reduced. This is due largely to the prolonged drought affecting the northern section of the country, which has required the substitution of steam-generated energy to meet deficiency.

The report shows that the proportion of the country's electrical energy requirements generated from water power has fluctuated between 34 and 40 per cent of the total and concludes that "the past ten-year period has developed no definite trend toward either steam or hydro. The division of the total production between the two sources remains about the same as it was ten years ago with only a little more than one-third of the requirements being supplied from water power." It is even admitted that in view of this fact there may be some question as to whether the objective of the federal water-power act, passed "to encourage and stimulate the development and utilization of the nation's latent water-power resources," has been achieved.

In explanation of why the country is not making larger use of its water-power resources in preference to steam power, the report points out that it is in the midst of a period of great production of cheap fuel. It also draws attention to the fact that the water-power resources of the country are unevenly distributed and that even though the advances in the science of long-distance transmission have permitted wider distribution, the economic limit for transportation of energy is about 300 miles.

Another factor of far-reaching effect on water-power development upon which the report dwells consists of the remarkable improvements made in the efficiency of modern fuel-using stations. The report says:

Hydro Must Combine with Steam

The altered conditions have led to frequent expressions to the effect that henceforth hydraulic power will be of diminishing importance and development of most of the remaining sites will be found economically impracticable. The facts available do not warrant any such general conclusion. Admittedly water power is faced with much keener competition than it has ever had to meet in the past, but in many situations it will be found to be clearly advantageous. The problem is complex, and the solution which will produce the lowest cost coupled with the most reliable service may be found only by searching analysis of each individual situation. Systems depending primarily on hydro power are finding it desirable to provide a substantial proportion of the needed generating capacity in steam plants as protection against periods of abnormally low water supply. On the other hand, those systems deriving the major part of their requirements from fuel power discover that the most economic arrangement includes some water-power capacity, particularly for use on the peak of the system load. A system served with generating capacity properly balanced between steam and hydro in most cases offers more favorable costs than if dependence is placed entirely on one source or the other. In other words, a combination of steam and hydro is more economic as a general rule than either one alone.

A lack of constructive public cooperation in solving the problems besetting prospective projects is pointed out by the report as another obstacle which hinders greater development. Relative to this the commission, after referring to the incidental benefits to irrigation, domestic water supply, navigation and flood control that accompany water-power development, says:

With all these public advantages resulting from water-power utilization, it might be expected that new developments would enjoy the utmost public encouragement. This, however, is not the case. On the contrary, the difficulties which must be overcome appear to be constantly increasing. As the population increases in arid or semi-arid regions water becomes more valuable and more sought after. There is much litigation of water rights which should be determined on sound engineering and social principles instead of through the stretching of many inapplicable laws and court decisions over this troubled field. The control of certain abuses has led to unnecessary handicaps for legitimate enterprises. The existing taxation has at times been unfair, and regulation is still seeking for the guidance of generally acceptable policies and principles. These obstacles will, no doubt, be overcome so that further progress may continue.

Favors State Regulation

Regarding the much-discussed subject of public utility regulation the commission plainly indicates that it considers this a field primarily for state rather than federal activity. On this point the report observes:

Very wisely, Congress by the act subordinated the regulatory powers of the commission to the jurisdiction exercised by the several states. It expressly provided in Section 19 that this commission might undertake control over the rates, service or security issues of public utility licensees engaged in intrastate business only until the state concerned has authorized a commission or other agencies to exercise such regulation. Relative to licensees engaged in interstate public utility business Section 20 of the act authorized the commission to perform regulatory functions only when one of the states concerned has not created proper regulatory authority or when the states are unable to agree between themselves.

It seems clear, therefore, that Congress thought of the control of electrical utilities as a local problem and that the imposition of a superior authority would be needed only in the event of disputes between states. Doubtless, it was recognized that electric power must of necessity be used in the immediate vicinity of its production and that its transportation lacks the complicated interstate relations affecting large groups of states as in the case of railroad transportation. Being a local problem, it was considered that its control might best be attained by local responsibility and local opinion.

During the nine years that have passed since the enactment of the law its administration has suggested no need for altering the present scope of its regulatory provisions. Necessarily, the activities of this character have been small under the limited jurisdiction conferred. Practically all of the states in which power plants are being operated under license authorization have duly constituted agencies to control the service rendered and rates charged to consumers.

In drawing attention to the large developments now being constructed under license the report directs attention to several noteworthy projects which "by their bold conception and advanced design offer convincing demonstration of the pre-eminence of American engineering skill in the water-power field."

Colorado River Status

The commission describes the Colorado River situation at some length, stating that it now has pending before it 43 applications for projects within the basin which have been suspended because of the legislative embargo imposed by Congress. The governors of the upper basin States — Colorado, New Mexico, Utah and Wyoming—have suggested that the public interest will be best served by further postponement of action on these cases, but the commission announces:

It is probable that the commission may wisely proceed with the consideration of a number of the applications on tributaries without affecting the interstate water questions remaining unsettled, and the reasons for delaying action are becoming less potent. It is equally apparent that no favorable action can be taken on any of the applications on the Colorado, Green, Yampa, Little Colorado or Williams Rivers without in some measure affecting the interstate water-right question. Five of the applications on the main Colorado River are in direct conflict with the Boulder Canyon project, and this is also true of certain units in four other applications. The act authorizing the construction of the Boulder Canyon project being now in effect, cancellation of these applications and conflicting parts of applications appears to be in order.

It is proposed to make a study of this entire situation and to determine as soon as practicable the general policy upon which the commission may best proceed and what applications, if any, may be taken up for consideration during the ensuing fiscal year without waiting for final settlement of the interstate water-right controversies.

The report shows that up to the close

of the fiscal year 1,002 applications had been filed with the commission. Licenses have been issued in 373 cases, which authorize in the aggregate an installation of 5,744,239 hp. The generating plants completed have a total capacity of 2,652,066 hp.

New England Industry Is Studied by Editors

Impressions of Group Representing Engineering, Industrial and Business Papers Summarized and Put Before Conference at Boston with Recommendations

RECENT study of industry in New England by a group of editors representing engineering, industrial and business magazines of the McGraw-Hill Publishing Company was summarized by Earl E. Whitehorne, assistant vice-president of that company, in a speech at Boston on November 22 before the fifth conference held under the auspices of the New England Council. After specifying "eleven favorable factors" and "nine unfavorable factors" in the situation as viewed by the editorial visitors, with due praise to New England accomplishments and progressiveness and some frank criticism of sporadic conditions that exist mainly because of the fact that industry in New England has been established so long that conservatism and tradition have inevitably firm roots here and there, Mr. Whitehorne put forth six recommendations based on a conviction that "New England is right now more highly organized for industrial progress than any other section of the country." The gist of these recommendations follows:

1. That a census of industrial modernization be made throughout New England. To accomplish this a competent engineering staff could be retained to inspect a cross-section of say one thousand manufacturing plants and arbitrarily rate them for modernization of buildings, lighting, safety, material handling, flow of work, progressive assembly, research, human relations and other characteristics.

2. That a centrally directed study be made through the state or local organizations of the effect upon industrial progress of (a) economics of plant location, as affecting the utilization of local resources and the local industries to buy from and sell to one another, thereby reducing cost of distribution and sale; (b) rate of pay, hours of operation and personnel policies; (c) facilities for local transportation of workers to plants or within the yards by street railway or bus, its effect on the use of private automobiles by employees and upon traffic congestion; (d) local taxation and regulations.

3. That systematic visiting of modern plants by New England industrialists be organized.

4. That the influence of transportation on New England industrial modernization be studied.

5. That the part played by electrification in the modernization of New England industries be studied. The electric power industry has done a splendid job in providing facilities. It should now be asked to co-operate more fully in the promotion of New England progress by taking a more vigorous responsibility in introducing better industrial lighting and those applications of electric power and heat that promote improved economies in manufacturing.

6. That a balanced program of educational promotion be organized through the New England Council, the state industrial associations and the chambers of commerce to the following purposes: (a) To inform and interest the people of New England in the romantic story of New England's industrial progress; (b) to advertise to the rest of American industry and business the economic strength of New England industries because of their diversification, their resources of plant, equipment, labor, finance, organization and their quality tradition; (c) to counsel and school local organizations in the most effective technique of presenting the picture of the natural industrial business, professional and civic resources of their communities to visiting groups.

Purchases and Mergers

The Public Service Company of New Hampshire has petitioned the State Public Service Commission for permission to acquire the Bethlehem, Lisbon, Freedom and Campton electric light companies, and those companies have asked authority to sell.

Certificates have been filed in the office of the Secretary of State at Albany under which the New York State Electric & Gas Corporation merges the Delaware & Otsego Light & Power Company and the Eastern New York Electric & Gas Company merges the Berlin Electric Light, Heat & Power Company.

The Masonville Light & Power Company, operating in Delaware County, N. Y., has asked the Public Service Commission for consent to transfer its plant to the New York State Electric & Gas Corporation.

Recent sale of the Bradford & Gettysburg Electric Light & Power Company, Bradford, Ohio, to the United Public Service Company of Chicago took place.

The Ohio Electric Power Company, Sidney, has asked the Ohio Public Utilities Commission for authority to purchase the Citizens' Light & Power Company, the Rockford Light & Power Company, and the Ansonia Light Company, all in Ohio, for $560,000 cash.

Municipal plants at Grant and Venango, Neb., have been purchased by the Western Public Service Company of Scottsbluff. The municipal plant at Bancroft, Neb., in the northeastern Nebraska territory served by the Iowa-Nebraska Light & Power Company, has been purchased by the latter.

Purchase of the electric power plant and distribution system of the town of Westville, Okla., is announced by the Public Service Company of Oklahoma.

The Virginia Public Service Company has bought the Harpers Ferry (W. Va.) Electric Light & Power Company.

The latest development in the municipal utility situation at Danville, Va., where the proposed sale of the city's electric and gas plants has been a matter of controversy for several years, is the resolve of the City Council by five to four to advertise them for sale and receive bids up to December 23 at noon. The successful bidder must put up a bond of half a million dollars that the rates will not be raised during the first ten years of the 30 years' franchise either with or without the consent of the State Corporation Commission.

Wants New Geographic Division of N.E.L.A.

President Sloan Thinks Virginia, Maryland, Delaware and District of Columbia Should Form One—Well-Known Speakers Greet Virginia Utilities Men

MORE than three hundred delegates and guests, including representatives from all sections of Virginia and several neighboring states, assembled on Thursday, November 21, at Old Point Comfort for the fourth annual convention of the Public Utilities Association of Virginia. Throughout the day there was an almost uninterrupted series of general sessions, group luncheon gatherings and committee meetings, in which the participants numbered both men and women, the latter taking an unusually prominent part.

One of the features of the convention, which remained in session through Friday, was the liberal use made of the "movietone," which was employed in producing addresses by Sir Ernest Benn of London, Albert Pirelli of Italy, Marshall E. Sampsell, Martin J. Insull and W. J. Hagenah, all well known to the electrical industry.

Matthew S. Sloan, president of the National Electric Light Association, had expected to be present, but was prevented because of a summons by President Hoover to attend a business conference at Washington. His address was read by Harry Reid, chairman National Public Relations Section, N.E.L.A. In it Mr. Sloan advocated the formation of a geographic division of the N.E.L.A. to include Virginia, Maryland, Delaware and the District of Columbia. He reviewed the achievements of the electrical industry and its effect on social life, prophesying still greater things in the future, when adequate wiring and lower prices for domestic use attract housewives to electrical appliances in ever-increasing numbers.

Mr. Sloan also greeted the association through the "movietone." Dr. J. A. Burrus, president Virginia Polytechnic Institute; Louis S. Epes, chairman of the State Corporation Commission; R. H. Mangum of the Alabama Power Company, and Paul S. Clapp, managing director N.E.L.A., were others on Thursday's program. Dr. Burrus' topic was the relation of educational institutions to public utilities, Mr. Epes' the relations of the holding company to the local operating company, and Mr. Mangum's "Balancing Agriculture and Industry."

At Friday's session the retiring president of the Public Utilities Association, A. W. Higgins, reviewed its work briefly. Several utility women gave practical talks and T. E. Roach, general commercial manager National Electric Power Company, New York, discussed merchandising and its effect on public relations.

The officers elected for the coming year are as follows: President, C. B.

Short, general manager Roanoke Railway & Electric Company; first vice-president, T. Justin Moore, vice-president Virginia Electric & Power Company, Richmond; second vice-president, Herbert Markle, Appalachian Electric Power Company, Bluefield; third vice-president, M. J. O'Connell, Alexandria; treasurer, A. H. Herrmann, Richmond. The president was empowered to select a secretary to succeed Allyn B. Tunis, who resigned to accept a position with the American Gas Association in New York.

No Decision This Year on Flathead Project

Federal Power Commission's Course in Hearings Criticised as Setting Bad Precedent—Applications for Licenses and Preliminary Permits

CONSERVATION in the form of utilization of water power now running to waste has received a material setback because of the precedent established by the recent hearing before the Federal Power Commission in the Flathead Lake case, in the opinion of some who are following the case closely. In this case the commission set aside its own rules of procedure in taking the hearing out of the hands of its technical staff. This action doubtless was influenced by the support given this demand by two members of the Senate. The criticism expressed is that if political considerations are to influence or greatly delay decisions, established power companies will build steam plants rather than fight disappointed applicants for hydro-electric rights.

No decision in the Flathead project is likely until well after the turn of the year. Interested parties have until December 5 to file briefs, and an additional ten days is allowed for the submission of reply briefs. This will prevent consideration of the matter until after the holidays. Even then it is uncertain when the three Cabinet members composing the commission will have an opportunity to review the voluminous testimony taken in the case.

The California-Oregon Power Company of San Francisco has applied for a license covering a constructed transmission line 44 miles in length, extending from the Fall Creek power plant to the West Side power plant at Klamath Falls. The company also has applied for one covering the construction of a 38,000-volt line 18 miles long from a point near Klamath Falls to Bonanza, Ore.; for one covering a constructed project on Rogue River, in Oregon, partly on public lands, which consists of an 18-ft. dam, 415 ft. long, on which 1,600 hp. is installed, and for one covering a constructed line 4½ miles long in the Tule Lake area.

The Pacific Gas & Electric Company has applied for a license covering a partly constructed 11,000-volt line 8 miles long from the company's Alleghany substation to Spanish Mine, and the Idaho Power Company for one for a 132-kv. line 3 miles long to extend from the applicant's American Falls-Shoshone Falls line to the Reclamation Bureau's substation on the Minidoka project.

The Fargo Engineering Company of Jackson, Mich., has applied for a license covering a project on the Kalamazoo River at the so-called Manlius site near Allegan. This application conflicts in part with one previously filed by the city of Allegan. It is proposed to provide a head of 25 ft., to create a reservoir of 6,200 acres and to install 6,000 horsepower.

D. C. Brownell and L. V. Ray of Seward, Alaska, have applied for a preliminary permit for the development of Lost Lake, in Seward Precinct, Alaska. Estimated power capacity is 4,000 hp.

The Pioneer Packing Company, Seattle, asks a preliminary permit to develop 100 hp. at Cordova, Alaska.

Protests Against Couzens Bill Await Senate Hearings

While no plan of operations has been formulated, those who have in hand such preliminary work as is being done about it say it is probable that hearings to be held by the Senate committee on interstate commerce with reference to the Couzens Communications and Power Commission bill will be held some time in December, after the regular session of Congress has begun. They say also that it is likely that the radio phase of the subject will be taken up, or resumed, first, some hearings on this having been held several months ago. Formulation of definite plans for the hearings has been delayed by the Senate's absorption in tariff revision discussions.

Representatives of the states, and especially of state public utilities commissions, are likely to take a large part in the hearings, particularly with relation to the feature of the Couzens bill envisaging federal government regulation of interstate distribution of electrical power by companies which operate across state lines. Indications are that most of the state commissions will oppose that feature of the law at the hearings. A number of them, including Colorado, Connecticut, Kentucky, Montana, New Mexico and North Dakota, have already passed resolutions disapproving it.

Wide differences of opinion are expected to be voiced as to the telegraph, telephone and radio regulation features of the bill. Senator Couzens said last week that he had discussed his measure with the president of the National Association of Railroad and Utility Commissioners, Charles Webster, and was advised that the association feels such legislation invades state rights over wire communications and power transmission. The Senator said that he is willing to alter the provisions on wire communication to conform with the less broad authority granted over power transmission.

Admitting that those sections of his bill relating to power transmission have been questioned in some quarters as to constitutionality, Mr. Couzens declared that he personally had no doubts on the subject, believing that the Supreme Court has found vested in Congress full authority for this regulation, even to the extent of reaching the activities of utility holding companies.

Interstate Transmission Is Not Commerce

So P. H. Betts Tells New Jersey Utilities Men — Professor Grayson Thinks Utility Stocks as a Whole Soared Far Too High

PROMINENT speakers at the fourteenth annual convention of the New Jersey Utilities Association, held at Atlantic City on November 22, were Colonel Philander H. Betts, chief engineer of the Board of Public Utility Commissioners of New Jersey, and Theodore J. Grayson, professor of finance at the University of Pennsylvania. Mr. Betts spoke on the proposed extension of federal government activities to include interstate electric lines. For this he saw no reason.

"When we purchase electrical energy or gas or water," Mr. Betts said, "is the service received to be regarded as interstate commerce simply because it crosses a state border? I am unable to recognize interstate service in the supplying of electrical energy. The company that supplies electricity to me makes it a service that is practically one from the St. Lawrence River to the Gulf. It would seem that the bulk of electrical energy is still consumed in the vicinity of power plants. Ninety per cent of all electricity is consumed in the state in which it originates. The 10 per cent of power that crosses a state line is owned by the producing company, so that nothing in the nature of interstate commerce is involved. Statistics indicate that the distance traveled by electricity is being shortened. In 1928 electricity created by hydro plants was at its highest in volume, but that is not a condition that, to my mind, will continue."

Professor Grayson criticised the prices at which utility stocks were sold during "the Coolidge bull market." Many men otherwise entirely reasonable citizens seemed to be willing to buy utility securities at a price which would net them a return of from 1½ to 2 per cent of their money, he said. He added: "The only explanation seems to be that they were discounting the future with optimistic hopes of rapid capital appreciation and increased dividends. Utilities as a whole have been far too high in price, and any one who thinks that they are coming back to the altitudes of the recent past is, in my opinion, fooling himself badly. They are not coming back for the simple reason that they never had any right to be there in the first place, and the American people have learned this fact as a result of a most unpleasant and unprecedented jolt."

Briefer News

LAST GAS LAMPS DISAPPEAR FROM BUFFALO STREETS.—Every street in Buffalo is now lighted by luminous-arc or incandescent lamps, the last gas lamps having been replaced with electric ones last week. There are 20,900 electric lamps in service, of which 7,120 are fed by overhead wiring and the remainder by underground.

SNAKE RIVER SITE IN IDAHO IS FILED ON.—Application has been made to the state authorities of Idaho for permission to build a power plant on Snake River, between Bliss and Glenns Ferry. The project, which is sponsored by W. A. Van Englen of Twin Falls, calls for the construction of a dam 130 ft. high, 700 ft. across the top and 150 ft. at the base. A head of 150 ft. would be gained by means of a canal, and it is hoped to generate 80,000 hp. The cost is estimated at $1,500,000.

MALONE, N. Y., MAY BUILD STORAGE RESERVOIR, FACILITATING HYDRO PLANT.—Consideration is being given at Malone, N. Y., to the project of building a storage reservoir at Titusville as a municipal enterprise. This reservoir, the cost of which is estimated at $2,000,000, would bring the regulation of the Salmon River and, it is said, make possible the development of 12,000 hp. The idea is to lease the reservoir to a hydro-electric company at a price that would pay interest on the necessary bond issue and gradually retire it.

GEORGIA COMMISSION ORDERS RURAL LINE RENTALS REDUCED.—A reduction of 50 per cent in line rental charges to rural districts in the state has been ordered by the Georgia Public Service Commission. Former line rental charges made by the Georgia Power Company, which is the most affected by the order, amounted to $5 per customer for five users per mile or under, $3 when customers numbered more than five and under ten, $2 for more than ten and under fifteen, $1.50 for more than fifteen and under twenty, and no charge with more than twenty customers per mile. Under the new rates the rental charge in the respective cases will be $2.50, $1.50, $1, 75 cents and nothing.

SOUTHERN SIERRAS POWER COMPANY FIGHTS RATE DECISION.—The Southern Sierras Power Company has challenged the legal right of the State Railroad Commission to regulate electric rates outside of California, which it is charged was done, contrary to the constitution of the State of California, in the commission's decision of November 4 (ELECTRICAL WORLD, November 16, page 1001) lowering rates of the company by an approximate total of $300,000 per year. This is one of several contentions made in a petition that has been filed with the commission by the company applying for a rehearing in the matter of the revaluation of the company's properties and alleging that the new rates are confiscatory. The petition asserts that the commission in its appraisal left out many important items which should properly have been included and that at the prices fixed the company would receive a return of only 4.329 per cent.

FLOODLIGHTING THE CATHEDRAL OF SAN LUIS POTOSI.—Cathedrals in Mexico are beginning to use floodlighting to beautify their edifices. Conspicuous among these illuminations is that of the cathedral at San Luis Potosi. Here four Westinghouse type 1,000-watt floodlight projectors are used to illuminate the two towers and the entrance.

The tower in the background is constructed of a stone much darker than the one in the foreground; consequently the rear tower seems to be less brilliantly flooded, but as a matter of fact the intensity of the light on the two towers is the same.

WYOMING GOVERNOR FAVORS FLAMING GORGE DAM.—Wyoming favors construction of the Flaming Gorge project in northeastern Utah, for which a bill has been introduced at Washington by Senator Smoot, but an understanding must first be reached between the four states of the upper Colorado basin (Utah, Wyoming, Colorado and New Mexico) over water rights, according to a letter written by Governor Frank C. Emerson of Wyoming to Governor George H. Dern of Utah. The letter followed inquiries addressed by Governor Dern to the Chief Executives of Wyoming and Colorado. Governor Dern had, he said, expected the Smoot bill to include provisions for both the Dewey and the Flaming Gorge dams. Wyoming probably would be more affected by the Flaming Gorge project than Colorado, but the latter state probably would be affected more by the Dewey project, were it contemplated. New Mexico would not be affected by either.

ILLINOIS POWER COMPANY EXPANDING.—A. D. Mackie, general manager of the Illinois Power Company, announces that a tentative program of additions and betterments in 1920 to the company's properties in Springfield, De Kalb and Sycamore covers expenditure of $1,000,000 in boiler and generating equipment, transmission-line extensions, putting wires under ground, rural extensions and other improvements in all branches of its service.

OREGON, TOO, HIT BY THE DROUGHT.—Not only has the water shortage in Washington State become so serious that Tacoma has had to ration its city customers and cut off those beyond the city limits, but also, according to Oregon hydrographic records as far back as such records have been kept, the present stage of all rivers and streams in that state is below any heretofore known. Power streams are no exception to this rule, and Oregon is being supplied with electrical energy generated by auxiliary steam equipment to an unprecedentedly great degree.

VIRGINIA PUBLIC SERVICE WILL CONNECT HARPER'S FERRY WITH ALEXANDRIA PLANT.—A survey has been started for the construction of a power line that will link the Harper's Ferry (W. Va.) Electric Light & Power Company's plant with the lines of the Leesburg (Va.) Electric Company, both of which companies have recently been purchased by the Virginia Public Service. The new line will provide the holding company with a line from Alexandria, Va., to Harper's Ferry. Another line will be built from Leesburg to Oatlands.

ANTIOCH COLLEGE TO MAKE OWN ELECTRICITY.—Included in a construction program at Antioch College, Yellow Springs, Ohio, which will cost $350,000, is a power plant to furnish the college with all its own electricity. The plant will be designed so that electrical engineering students may use it as a laboratory. The science building, which is now under construction, will be a four-story structure with 220 rooms. It will contain two insulated and shock-proof compartments for especially delicate instruments, to be hewn out of the solid rock below the basement level.

LAKE OF THE WOODS AND WATER POWER.—One of the principal uses of Lake of the Woods in northern Minnesota is as a storage reservoir for water-power purposes, Adolph F. Meyer of Minneapolis, consulting hydro-electric engineer, testified in the United States District Court, St. Paul, at a recent hearing in the first of ten test suits in which the federal government is appealing awards made to property owners on the American side of the lake

for flowage easements acquired by condemnation. The landowners contend that the value of their property is enhanced because of the adaptability of the lake for water-power uses. The government contends that the awards should be based only on the market value of the land for general purposes. Mr. Meyer asserted that the lake is valuable for water-power storage purposes because of its size and geographical location and because its drainage area is 26,750 square miles. The suit at issue involves damage caused by a dam at Kenora owned and operated by the E. W. Backus interests.

CENTRAL ELECTRICAL CREDIT ASSOCIATION MEETS IN CHICAGO.—Meeting in Chicago on November 21 and 22, the Central Division of the Electrical Credit Association held four "credit clinics." Among the subjects up for discussion were the present-day responsibility of credit managers, the electrical contractors' and dealers' interest in credit control, successful letter writing, presentation of electrical contracting, constructive credit service, banking law for business men, credit angles on installment selling, and thirteen practical topics grouped as "vital credit problems."

INSULL NEW ENGLAND INTERESTS OPPOSE PLANS OF NEW ENGLAND POWER ASSOCIATION.—Opposition to the plans of the Grafton Power Company to erect transmission lines to the Massachusetts border from the New England Power Association's hydro-electric plant now under construction at Fifteen-Mile Falls on the Connecticut River was expressed to the New Hampshire Public Service Commission last week by the Public Service Company of New Hampshire, an Insull utility. Its representative, Everett H. Maxcey, said he felt that the New England Power Association should not solicit business from utilities that now are being supplied by the Public Service Company. The commission, however, saying there is and can be no monopoly in New Hampshire so far as wholesaling electrical energy is concerned, refused to entertain the protest.

BIRMINGHAM (ENGLAND) POWER STATION STARTS OPERATION. — The first section of the large generating station near Birmingham, England, which is to take a major part in supplying electricity under the Midlands scheme of the Electricity Commissioners, was recently put in operation. The section contains two turbo-generators rated at 30,000 kw. each. It marks the start of the process of standardizing the electrical frequencies of the district and of the extension of the area of supply. It has cost $7,000,000, as compared with a total of $16,000,000 which will be the cost of the completed station, when its output will be 210,000 kw. The transmission system in course of construction will allow every village in the neighborhood of Birmingham and many others over a much greater area, stretching from Stoke-on-Trent to Buckingham and Newark to the Welsh Marches, to be supplied with electricity, the number of generating stations being reduced from the 46 at present in existence to 19.

EAGLE PASS DEVELOPMENT AWAITS FORMAL APPROVAL.—As soon as the Texas Board of Water Engineers gives formal approval of the $6,000,000 of bonds of the Maverick County Water Improvement District No. 1 of Eagle Pass, the construction of a system of irrigation and a hydro-electric plant will be started. The water supply will be obtained from the Rio Grande. The canal and ditch system which will convey the water over 60,000 acres of land will cost approximately $5,000,000 and the hydro-electric plant will cost $1,000,000. The permit granted a total use of 1,500 sec.-ft. of water, of which 900 sec.-ft. is for power purposes. Should the district choose, it can use up to 1,500 sec.-ft. for power purposes when none is being used for irrigation. The limit for irrigation is 600 sec.-ft. under any condition.

NEW COMMERCIAL RATES FOR ALABAMA POWER COMPANY PROMULGATED. —The new schedule of commercial lighting and power rates for the Alabama Power Company which the Public Service Commission of the state has had under consideration for some months (ELECTRICAL WORLD, August 10, page 294) has been promulgated. It is estimated that the new tariff, which presents the option between two forms of rate, will reduce the revenues of the company about $500,000 annually and bring a saving to about 80 per cent of the customers affected. The commission's order, which will become effective January 1, is in the interest of uniformity throughout the state. The service classifications for short-hour use are materially affected. A revised form of street lighting affects 95 per cent of the 152 towns and cities served.

SYDNEY TELEPHONES NEW YORK VIA LONDON.—A recent radiotelephone conversation between New York City and Sydney, Australia, via London, a distance of 15,000 miles, is the longest ever recorded, according to a report from Assistant Trade Commissioner Lewis R. Miller, Sydney, to the Department of Commerce. Direct wireless communication between Sydney and New York is not unusual, but a telephone conversation via London is a novelty. Transmission from Sydney was through a 20-kw. transmitter. Reception in England was at the government station at Baldock, thence by land line to London. In the transfer to New York the message was sent by land line to the government station at Rugby, thence by radio to the New York receiving station and from there by land line to the New York telephone exchange.

GLOUCESTER (MASS.) CHAMBER OF COMMERCE CONDEMNS MUNICIPAL-PLANT AGITATION.—Political agitation for the entry of the city of Gloucester, Mass., into the electric lighting field received a setback last week, when the Gloucester Chamber of Commerce made public a unanimous report condemning the project on the ground that in 45 municipally owned Massachusetts plants the average rate per kilowatt-hour is more than one-third more than the average rate of private companies. The chamber also declared that the cost of purchasing the plant of the Gloucester Electric Company would be prohibitive. A referendum will be held December 3. Since the Gloucester company was acquired by Charles H. Tenney & Company of Boston about two years ago the service has been greatly improved and rates substantially reduced.

NEED FOR VALUATION OF ST. LOUIS COMPANY'S PROPERTIES AWAITS COMMISSION'S DECISION.—The Missouri Public Service Commission's book audit of the Union Electric Light & Power Company of St. Louis will be completed about the end of this year or early in 1930. It has been in progress for eighteen months, and the final results will determine whether the company must reduce its rates below the voluntary cuts made in June, 1928. The city of St. Louis is endeavoring to obtain a reduction in residential and other rates of approximately $2,000,000 a year. If the commission thinks the book audit indicates that a complete valuation of the company's property is justified, it will issue an order to that effect. The company contends that its present rates are

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue of July 6, page 46.]

American Institute of Electrical Engineers—District meeting, Chicago, Dec. 2-4; winter meeting, New York, January 27-31. F. L. Hutchinson, 33 West 39th St., New York.

American Institute of Mechanical Engineers—New York, Dec. 2-6. C. W. Rice, 29 West 39th St., New York.

American Society of Refrigerating Engineers—New York, Dec. 4-7. D. L. Fiske, 37 West 39th St., New York.

Empire State Gas and Electric Association—Electric Section, Briarcliff Manor, N. Y., Dec. 5-6. C. H. B. Chapin, Grand Central Terminal, New York.

National Electrical Credit Association—New York Division, Hotel Pennsylvania, New York City, Dec. 10; New England Division, University Club, Boston, Jan. 21. F. P. Vose, 1008 Marquette Bldg., Chicago.

American Engineering Council—Washington, Jan. 9-11. L. W. Wallace, 26 Jackson Place, Washington, D. C.

Conference of Electrical Leagues—Westinghouse Lighting Institute, New York, Jan. 13-16. Society for Electrical Development, 420 Lexington Ave., New York.

North Central Division, N.E.L.A.—Commercial Section, St. Paul Hotel, St. Paul, Jan. 20-21; Engineering Section, Nicollet Hotel, Minneapolis, Feb. 24-25. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

National Electrical Wholesalers' Association—Pacific Division, Del Monte, Calif., Jan. 31-Feb. 1.

reasonable and points out that valuation proceedings would require several years and cost at least $1,000,000.

COURTS AGAIN HAMPER CENTRALIA'S HYDRO PLANS. — The hydro-electric project on the Nisqually River proposed by Centralia, Wash., has struck another legal snag as a result of a temporary writ of prohibition issued by the Lewis County Court ordering the city to refrain from making effective a proposed ordinance declaring an emergency appropriation of $676,423 in the 1930 budget. The injunction suit in which the writ was issued was filed by H. M. Jones, a taxpayer and an employee of the Eastern Railway & Lumber Company, which now sells lighting to the city. The voters of Centralia twice have approved the project, the second vote having become necessary when the State Supreme Court declared the first election invalid.

ROCKLAND LIGHT & POWER COMPANY'S NEW DEVELOPMENTS. — The Swinging Bridge storage and power development of the Rockland Light & Power Company, Nyack, N. Y., one of its chain of hydro plants on the Mongaup River, is on the point of completion. It has a head of 125 ft. and a capacity of about 7,000 hp., and it will supplement the 5,750-hp. Mongaup Falls plant completed in 1923 and the 14,000-hp. Rio plant completed two years ago. The Swinging Bridge development will be followed by a 14,000-hp. plant at Delaware Ford and a 1,500-hp. plant at the company's Toronto storage reservoir near the headwaters of the river, which rises in the Catskills and flows into the Delaware River. The two developments last named are scheduled for completion in 1931 and 1932 respectively.

COAL TRAVELS 700 MILES FROM MINE TO BOILERS IN THREE DAYS.—In a test authorized by Matthew S. Sloan, president of the New York Edison Company and associated electric light and power companies, coal that was in the mine in the mountains of West Virginia on Tuesday, November 19, was on Friday, November 22, being fed under the boilers of one of the power plants of the system. The test was carried through by W. W. Erwin, controller of the New York Edison Company, and officials of the Pocahontas Fuel Company. The order consisted of 6,000 tons, or a train load of 75 cars. Mined on Tuesday, the coal was immediately loaded into cars and transported the 400 miles to Norfolk, Va., by the Norfolk & Western Railroad. In three hours after arrival it had started on its 300-mile journey by collier to New York. On Friday afternoon at 3.10 o'clock the boat docked at the Hell Gate generating station of the United Electric Light & Power Company, on the waterfront, and five minutes later the coal was being conveyed to the bunkers on its way to the boilers.

Recent Court Decisions

PLACING HIGH-TENSION TRANSMISSION LINE FIVE FEET FROM LOCATION OF COMING BUILDING PRESENTS ISSUE OF NEGLIGENCE.—The New Jersey Court of Errors and Appeals has sustained a finding for the plaintiff in Heyer vs. Jersey Central Power & Light Company, a suit for damages because of the death of a workman upon an uncompleted building who was killed by electric shock while placing a derrick in operation. Evidence was given that the defendant's 33,000-volt line was placed 5 ft. above and 5 ft. out from the wall of the building, of whose coming construction the company knew when it strung its wires, and that an electric current of that voltage would jump from 3 ft. to 4 ft. or more on a damp day. This testimony, the reviewing court held, justified the trial judge in submitting the question of negligence to the jury. (147 At. 452.)*

FAIRBANKS-MORSE MUNICIPAL CONTRACT SUSTAINED BY UTAH SUPREME COURT.—Barnes vs. Lehi City was a proceeding brought to prevent Lehi City, Utah, from entering into a conditional sales contract with Fairbanks, Morse & Company for the purchase and installation of an electric generating unit with its accessories, for the purpose of enlarging the capacity of the electric light and power plant now owned and operated by the city. The contract provides, among other things, that the city shall pay the company for the machinery and labor incident to installation out of a special fund created by the city from the product or service of the plant, and that the obligation to pay is not a general obligation of the municipality, payable from taxes or its general fund, but only a special obligation payable from the net revenues of the electric light and power plant of the municipality. It was alleged in the application for the writ that the amount to be paid under the proposed contract, added to the present running indebtedness of the city for the current year, will be in excess of the taxes and revenues of the city for such year, and that no certificate of public convenience and necessity was ever applied for or obtained from the Public Utilities Commission to authorize the city to enter into the business of selling electrical energy to its inhabitants. In denying the writ the Supreme Court held that the contract did not create an indebtedness within the meaning of the constitutional limitations and that the city was not required to procure a certificate of convenience and necessity from the commission before entering into the contract to enlarge its existing electric power plant. (279 Pac. 878.)

CHANGING "FOR" TO "IF" IN REQUESTED INSTRUCTION NOT ERROR.—"PREJUDICE AND PASSION."—In Veronee vs. Charleston Consolidated Railway & Lighting Company there resulted a verdict of $35,000 damages to the plaintiff, a workman who was seriously hurt by coming in contact with a busbar while, as alleged, carrying out his superior's orders, and a reversal was sought mainly on the ground of contributory negligence. The trial judge was charged with error because he changed a requested instruction to the jury which concluded "*for* in doing the act plaintiff would be guilty of contributory negligence" to "*if* in doing the act," etc., thereby converting a desired interpretation of the law into a mere statement of disputed fact for the jury's decision. The amount awarded—the full sum claimed—was also declared so excessive, the victim's injuries consisting chiefly of severe electrical burns and the loss of a finger and metacarpal bone of the left hand, as plainly to indicate "prejudice and passion" on the part of the jury. The Supreme Court of South Carolina overruled both these contentions and sustained the trial court in its construction of contributory negligence and approval of punitive damages. (149 S. E. 753.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

COMMISSION HOLDS THAT IT IS WITHOUT POWER TO ORDER REFUND OF OVERCHARGE.—The New Jersey Board of Public Utility Commissioners has no power to order refunds of overcharges either for rates or deposits, according to a decision at which it arrived in a complaint brought against the Atlantic County Water Company and concerning a contract under which a deposit was made with provision for a refund which the complainant subsequently maintained was insufficient. The commission said: "There is no general power by statute vested in the board to order refunds of overcharges either for rates or deposits. In the instant case if the board were to order the company to refund a sum greater than that provided by the terms of the contract, it would be a clear violation of the contractual obligations that the parties themselves entered into."

COMPLAINANTS WHO ATTACK ESTABLISHED RATES HAVE BURDEN OF PROOF.—Rates of the Beaver Valley Water Company were attacked before the Pennsylvania Public Service Commission by the Pittsburgh Wall Paper Company and two others. The protest of the Pittsburgh company was filed before the effective date of the tariff and subsequently withdrawn. The other protests were filed after the rates went into effect, and no evidence was produced to prove them unfair. The commission said: "Complainants take the position that inasmuch as the complaint of the Pittsburgh Wall Paper Company was filed prior to the effective date of the tariff, so that in that proceeding the burden was upon respondent to show that its rates were reasonable, the burden of proof is also upon the company to sustain its rates upon the complaints now before the commission. The commission does not understand this to be the law. . . . Where such changes in existing tariffs involve an increased rate, the burden of proving such increased rate reasonable is upon the public service company. No such burden is cast upon the company to defend its rates upon complaints filed against existing rates. Had the Pittsburgh Wall Paper Company seen fit to prosecute its complaint, respondent would have had the burden of sustaining its rates in that proceeding. That proceeding, however, was discontinued before the present cases came on for hearing and was never joined with them. Had all three complaints been heard and considered together for administrative convenience, the commission could not have required respondent to assume the burden of proof as against the latter complaints."

News About Men of the Industry

GEORGE H. HOWARD, president of the United Corporation, has been elected a director of the Chase National Bank.

DR. MOTOJI SHIBUSAWA, dean of engineering of the Tokio Imperial University, has been awarded an honorary membership in the American Institute of Electrical Engineers.

WILLIAM E. WOOD, vice-president of the Engineers Public Service Company and formerly president of the Virginia Electric & Power Company, was elected a director of the Engineers Public Service Company at a meeting of the board held November 21.

DR. YASUJIRO NIWA, chief engineer of the Nippon Electric Company, Ltd., of Tokyo, Japan, was recently signally honored by the Institute of Electrical Engineers of Japan, which awarded him the Asano prize for "meritorious achievement in electrical science, electrical engineering and electrical invention." The award has been made three times in the past.

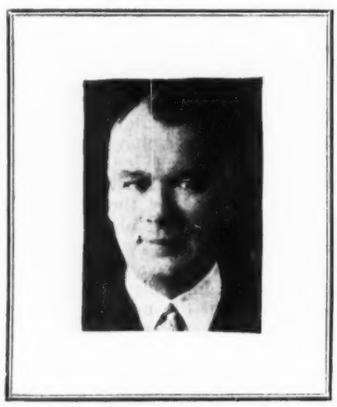
JOSEPH F. PORTER, president of the Kansas City Power & Light Company, Kansas City, Mo., donated as a gift to the College of Engineering of the University of Missouri special electrical equipment valued at $15,000. The donation was made by Mr. and Mrs. Porter, who desire to equip a laboratory to be designated as the Ralph E. Porter laboratory, in honor of their son of that name, who was accidentally electrocuted at the General Electric Company's plant at Schenectady, where he had worked but three days. Ralph Porter was graduated from the College of Engineering of the University of Missouri in 1926.

R. P. WAGNER was recently made manager of the newly formed rate and research division of the New York Power & Light Corporation's commercial department. He will make studies, investigations and analyses of all matters relating to gas and electric rates. Before removing to Albany he was assistant to T. C. Hamilton, consulting rate expert for H. L. Doherty & Company, New York. Previous to that connection he was general superintendent of the Durham Public Service Company of North Carolina. Mr. Wagner is a member of the rate research committee of the National Electric Light Association.

E. J. BURGER, manager of the Defiance division of the Toledo Edison Company, has been appointed division manager at Lorain for the Ohio Public Service Company to succeed A. H. Heitzler, who has assumed new duties in Denver. Mr. Burger has been connected with public utility properties in the Middle West since 1918, when he became distribution superintendent of the Lorain County Electric Company. Later he served as general superintendent of the City Light & Traction Company at Sedalia, Mo., from which position he was transferred to the managership of the Defiance division of the Toledo Edison Company, the position he occupied until his present assignment.

P. F. Sellers Vice-President Buffalo, Niagara & Eastern

Paulding F. Sellers, recently elected vice-president of the Buffalo, Niagara & Eastern Power Corporation, was formerly vice-president in charge of operation of the Buffalo General Electric Company, with which utility he had been connected for more than 32 years. He began as lineman's helper in the summer of 1897 and, working his way up in various capacities, he was finally made engineer in 1901. From that position



his advancement was consistent and successively he occupied the positions of assistant superintendent, general superintendent and finally in 1926 he was made vice-president in charge of operation. Born in San Antonio, Tex., in 1875, he received his education at Trinity Military School and Pennsylvania State College, from which institution he was graduated in 1897 with a degree of electrical engineer. The Buffalo General Electric Company was the first company with which Mr. Sellers was associated.

J. A. FORNEY, who has been assistant manager of the Charlotte (N. C.) branch of the Southern Public Utilities Company, has been appointed manager of the branch, to succeed the late Harry A. Orr. At the same time announcement was made of the appointment of CHARLES B. MILLER, JR., who has been assistant manager of the Greenville (S. C.) branch of the utilities system, to the position of assistant manager of the Charlotte branch. Mr. Forney has been a member of the Charlotte organization since 1918. Mr. Miller has been with the organization for the past four years, joining the Greenville branch as a salesman and rapidly rising to the position of sales manager and later to the office of assistant manager of the Greenville branch. Before joining the utility company Mr. Miller was with the General Electric Company for several years after his graduation from Virginia Military Institute at Lexington, Va., where he specialized in civil and electrical engineering.

JOHN E. S. THORPE, formerly general superintendent of the Knoxville Power Company, Calderwood, Tenn., has been named president of the Nantahala Power & Light Company, Bryson City, N. C.

ELMER A. SPERRY, head of the American delegation to the World Engineering Congress which was held in Tokyo recently, was decorated with the Order of the Sacred Treasure, second class, in recognition of his services in the cause of Japanese-American friendship.

JOHN K. SWANSON, vice-president and general manager of the Minneapolis Gas Light Company, has been elected a vice-president of the American Commonwealths Power Corporation, holding company which controls the Minneapolis organization and other electric and gas utilities in important cities of the United States. Mr. Swanson will continue in executive charge of the Minneapolis Gas Light Company.

JOHN J. WINN, JR., sales manager of the Fall River Electric Light Company, has resigned to become development engineer with the Consolidated Gas, Electric Light & Power Company of Baltimore. Mr. Winn affiliated himself with the Fall River utility as chief industrial engineer after a connection with the Haverhill properties and it was he who established the house heating division of the sales department. Two years ago he was made industrial sales manager and later sales manager.

CLAUDE C. BROWN, who has been acting as natural gas administrator for California since July, 1927, has been appointed gas and electric engineer by the California Railroad Commission to succeed Charles Grunsky, resigned. Mr. Brown will be head of the gas and electric division of the commission's engineering department, and in addition will continue for the present to act as natural gas administrator. Mr. Brown has been connected with the engineering activities of the commission since November, 1922, when he was appointed assistant valuation engineer. He is a graduate of the University of California, engineering school, having received his degree of bachelor of science in electrical and mechanical engineering in 1914. Prior to his affiliation with the commission he was engaged in engineering work for the J. G. White En-

gineering Company of New York, the Pacific Gas & Electric Company, Southern California Edison Company, Northern California Power Company, Pacific Power & Light Company, Southern Pacific Company and Pacific Steamship Company. He is a member of the American Institute of Electrical Engineers, American Society of Mechanical Engineers and the American Petroleum Institute.

JOSEPH BOWES, vice-president of the Virginia Electric & Power Company in charge of operations at Norfolk, has been appointed operating vice-president with headquarters in Richmond, to succeed Thomas P. Walker, who has assumed new duties in Texas.

IRVIN SEAMAN has been appointed superintendent of the transmission department of the New York Power & Light Corporation with headquarters in Albany. For eight years before becoming identified with the New York Power organization he was connected with the W. S. Barstow properties and for three years previous to that he was with the Hamburg (Pa.) Gas & Electric Company. He was associated with several electric operating companies in Illinois, South Carolina, Iowa and New Jersey.

CHARLES GRUNSKY, gas and electric engineer of the Railroad Commission of California, has resigned, effective November 15, to become supervising engineer with the management and engineering company, which will direct the activities of the Pacific Public Service Corporation, its subsidiaries and allied companies. Mr. Grunsky entered the employ of the Railroad Commission in 1914 as assistant engineer, and engaged in valuation work in 1914 and 1915, gas and electric work in 1916 and was in charge of the gas laboratory of the commission in 1917. Following discharge from military service he returned to the employ of the Railroad Commission in 1919 as assistant engineer, engaging in rate and valuation work. He was appointed gas and electric engineer, in charge of that divison of the commission's engineering department in the latter part of 1926.

MAJOR HOWARD S. BENNION, director of engineering of the National Electric Light Association, New York City, has been appointed a member of the executive committee of the national committee on wood utilization, according to an announcement made by R. P. Lamont, Secretary of Commerce and the committee chairman. Major Bennion is an outstanding authority in the electrical engineering field and as a member of this organization he will be called on for assistance in connection with the utilization of wood waste, which is one of the major projects of the committee. The light and power industry, which Major Bennion represents, is keenly interested in commercial reforestation, which is the committee's ultimate aim. This industry is a large consumer of the full range of forest products; it is also directly interested in the development of forest industries.

P. A. Schoellkopf Heads Niagara Hudson Corporation

Paul A. Schoellkopf, chairman of the Buffalo, Niagara & Eastern Power Corporation, has been elected president of the Niagara Hudson Power Corporation to succeed Ray P. Stevens, who resigned to devote his time to the presidency of the American Electric Power Corporation. Mr. Stevens will continue as a director of the Niagara Hudson Power Corporation.

COULTER D. YOUNG has been elected secretary of the International Paper Company. Mr. Young is a member of the New York and Connecticut bars and has had broad experience in corporate legal affairs. Following graduation from Yale College and Yale Law School he joined the legal department of the United States Steel Corporation. Later he was connected successively with the law firm of Stetson, Jennings & Russell, the American Trading Company, and then with Davis, Polk, Wardell, Gardiner & Reed, successors to Stetson, Jennings & Russell, leaving that organization to join the International Paper Company.

THOMAS FULLER, formerly manager of the Charlotte, N. C., office of the Westinghouse Electric & Manufacturing Company, has been appointed manager of the Atlanta district office to fill the vacancy caused by the death of H. A. Coles. Mr. Fuller has been prominently identified with many of the big electrical projects of the South and is well known in the electrical industry. He was graduated from the Georgia School of Technology in 1905 and in the following year he entered the employ of the Westinghouse company, with which he has been connected since that date.

GEORGE B. SANFORD, for the past three years secretary and assistant treasurer of the Grays Harbor Railway & Light Company, Aberdeen, Wash., sailed November 16 for Rio de Janeiro, where he will be associated with the Emprezas Electricas Brazileiras, an American & Foreign Power Company property. Mr. Sanford formerly was associated with the Denver Gas & Electric Company and the Great Western Power Company of California. For nine years he was in charge of the Great Western company's activities in Sacramento, and later served there as division manager.

E. W. FOWLER, who has been connected since 1906 with the Illinois Power & Light Corporation and the McKinley utilities, from which it was developed, has been appointed general manager of the Central Illinois group of that company with headquarters at Decatur, to succeed the late M. L. Harry. He was first identified with utility service in the office of the general manager of the Illinois Traction Company at Ottawa and Peoria, Ill., and with the organization of the Illinois Power & Light Corporation he acted as assistant vice-president with headquarters in Chicago until the summer of 1928. Then he was appointed general manager of the Northern division of the Illinois Power & Light Corporation with headquarters at Ottawa, the position he held until his recent appointment.

MATTHEW S. SLOAN, president of the New York Edison Company, was made the recipient of the honorary degree of doctor of engineering November 23 by the Alabama Polytechnic Institute, his alma mater. The degree, which was conferred by President Bradford Knapp, was received by Mr. Sloan on the same platform in old Langdon Hall where he received his first college degree 28 years ago.

THOMAS A. EDISON was honored by the Chamber of Commerce of the State of New York at its 161st annual dinner held at the Hotel Astor November 21. More than 1,000 persons, prominent in all walks of life, attended. The citation conferred upon Mr. Edison read: "Of all our honorary members, Mr. Edison holds the record for the longest term of membership, having been elected on October 7, 1889, a little more than forty years ago. Our predecessors in the chamber recognized only ten years after Mr. Edison's great triumph with the filament lamp that he had already added greatly to the world's knowledge and to human advancement. With a further forty years of scientific discovery and invention we cannot fail to recognize how wise and how foresighted those members were when they elected him an honorary member." A portrait of Mr. Edison was unveiled at the dinner. It will be placed in the gallery of the chamber's building at 65 Liberty Street.

Obituary

WALTER WELLS, veteran electrical engineer of the Province of British Columbia, died recently on Bowen Island, B. C. Mr. Wells had been well known in the electrical industry of the province for the past 22 years.

M. BARUT, one of the pioneers of the electrochemical industry in France, died recently in Paris. It is more than 30 years since Mr. Barut commenced the manufacture of calcium carbide at Giffre in Savoy, where later he developed the electrical production of special iron alloys.

HERMAN HOLLERITH, inventor of an electric tabulating machine used by the United States and foreign governments for accountancy purposes, died November 17 at his home in Washington, D. C., after an illness of two days. He was 69 years of age. He patented the original model of his accounting machine in 1890 and for this the gold medal of the Franklin Institute of Philadelphia was awarded to him as the most distinguished inventor of the year.

Financial and Statistical News

A PROGRAM OF IMPROVEMENT running well up to the billion-dollar mark is planned by the power and light industry for 1930, Matthew S. Sloan told business leaders at the Washington conference last week.

——UTILITY EXECUTIVES later met in New York to plan the extension policies outlined in accordance with the President's plans to "keep industry normal." Preliminary indications point to an exceedingly active year in new construction and reconditioning of properties.

——PRESENT EASY MONEY CONDITIONS should continue well into 1930. The stock market continues quiet with trading relatively light. The bond market is beginning to display a much healthier appearance.

Consumption of Electricity in Irish Free State

The consumption of electricity in the Irish Free State in 1928 was 67,000,000 kw.-hr. The figures on which the experts based the economy of the Shannon scheme was 110,000,000 kw.-hr. That the potential market for electrical power exceeds 110,000,000 kw.-hr. is believed from a survey made by the Electricity Supply Board of the number of steam, gas and oil engines in towns and villages of over 500 population in the Irish Free State and of the work they do. A careful calculation shows that outside the three leading cities of Dublin, Cork and Limerick the equivalent of at least 30,000,000 kw.-hr. of electricity is being used in industry, now provided by steam, gas or oil engines, all of which could be replaced by electric motors. In the three leading cities named estimates cannot be so accurate, but from sources which are considered fairly accurate it is believed that there is the equivalent of from 35,000,000 to 50,000,000 kw.-hr. of electricity being used in industry as motive power provided by steam, gas or oil engines.

Weston Electrical Instrument Reports Increase in Net

For the nine months ended September 30 the Weston Electrical Instrument Corporation reports a net income of $684,487 after depreciation, reserve for contingencies, federal taxes and other charges, equivalent under the participating provisions of the shares to $3.70 a share on 65,000 no-par class A shares and $2.95 a share on 150,000 no-par common shares. This compares with $380,430, or $2.19 a share, on 75,000 class A shares and $1.44 on 150,000 common shares in the corresponding period last year. Net income for the third quarter of the year was $222,565, equivalent to $1.21 a share on 65,000 class A shares and 96 cents a share on 150,000 common shares, against $133,819, or 76 cents, on 75,000 class A shares and 51 cents on 150,000 common shares in the third quarter last year.

New Belgian Company Is Organized

A new Belgian company under the name La Hispanobel is to be organized which will include all participation now had in Spanish business by the Electrobel, another Belgian company of recent formation, in which the Chemins de Fer Economiques of Brussels, the Société des Enterprises Electriques and El Gaz Belge have been united under the auspices of the Bank of Brussels and other powerful financial groups. The most important Spanish participant in La Electrobel is the Sociedad Regadios Energia de Valencia, with a capital of 40,000,000 pesetas (the par value of the peseta is 19.30 cents), which was organized more than a year ago for the purpose of developing agricultural and hydro-electric industries in the Valencia region.

CITIES SERVICE REPORTS GAIN IN STOCKHOLDERS. — Cities Service Company has announced that the number of its common-stock holders increased by 55,493 in the past month, bringing the

Current Earnings Reports of Electric Light and Power Companies

	1929	1928	Per Cent Increase	Operating Ratio 1929	Operating Ratio 1928
American Light & Traction & subs. (Year ended September 30)					
Gross earnings	$46,437,420	$39,716,654	22.6	58	58
Net earnings	19,587,916	16,715,138	17.2	..	..
American Power & Light & subs. (Year ended September 30)					
Gross earnings	87,636,155	73,012,941	20.0	49	52
Net earnings	44,708,643	35,056,551	27.6	..	..
American Water Works & Electric & subs. (Year ended September 30)					
Gross earnings	53,287,642	50,318,043	5.9	50	52
Net earnings	26,382,645	24,273,989	8.7	..	..
Buffalo, Niagara & Eastern Power & Subs. (Year ended September 30)					
Gross earnings	27,397,988	24,925,613	9.9	49	48
Net earnings	13,938,551	13,023,725	7.0	..	..
Carolina Power & Light (Year ended September 30)					
Gross earnings	9,353,270	8,955,139	4.0	46	50
Net earnings	5,076,794	4,449,200	14.0	..	..
Cities Service (Year ended October 31)					
Gross earnings	41,768,802	33,863,775	11.8	..	..
Net earnings	40,497,732	32,714,666	11.8	..	..
Columbia Gas & Electric & subs. (Year ended September 30)					
Gross earnings	113,216,560	103,922,080	8.9	50	49
Net earnings	56,854,490	53,305,263	6.6	..	..
Engineers Pub. Serv. & subs. (Year ended September 30)					
Gross earnings	47,253,875	30,719,636	53.6	57	59
Net earnings	$20,085,248	$12,459,503	61.5	..	..
Federal Light & Traction & subs. (Year ended September 30)					
Gross earnings	8,401,901	7,657,050	9.7	59	60
Net earnings	3,431,636	3,041,006	12.8	..	..
Kansas City Power & Light (Year ended October 31)					
Gross earnings	14,509,300	13,616,396	6.5	51	51
Net earnings	7,092,725	6,664,198	6.4	..	..
Nebraska Power (Year ended September 30)					
Gross earnings	5,838,968	5,194,560	12.0	50	53
Net earnings	2,867,117	2,441,712	17.0	..	..
Pacific Power & Light (Year ended September 30)					
Gross earnings	4,767,840	4,327,909	10.0	52	55
Net earnings	2,298,622	1,939,042	3.0	..	..
Portland Electric Power (Year ended September 30)					
Gross earnings	12,769,529	12,410,422	2.9	59	59
Net earnings	5,197,990	5,037,942	3.2	..	..
Public Service Corporation of New Jersey & subs. (Year ended October 31)					
Gross earnings	135,065,231	123,172,041	9.7	69*	71*
Net earnings	41,152,666	35,136,076	17.1	..	..
Texas Power & Light (Year ended September 30)					
Gross earnings	9,823,713	9,573,741	3.0	50	54
Net earnings	4,839,597	4,422,909	9.0	..	..
Utah Power & Light (Year ended September 30)					
Gross earnings	11,609,829	10,892,318	7.0	50	49
Net earnings	5,805,028	5,574,174	4.0	..	..

*Operating expenses include depreciation.

total on November 15 up to 303,727. The increase was the largest for any month in the company's history. The number of holders of all securities of the organization is now over 500,000.

Consolidated Gas of Baltimore Increases Dividend Rate

The board of directors of the Consolidated Gas, Electric Light & Power Company of Baltimore has voted to increase the quarterly dividend on the common stock from 75 cents to 90 cents a share. This places the annual dividend at the rate of $3.60 a share instead of $3, as heretofore. The directors also declared the usual quarterly dividends on the various classes of the company's preferred stock.

APEX ELECTRICAL MANUFACTURING COMPANY, Cleveland, Ohio, manufacturer of electric washers, reports net earnings for the third quarter before federal taxes of $136,716, as compared with $77,525 for the same period of 1928. This is an increase of 76.4 per cent. Current assets as of September 30 were $1,529,044 and current liabilities $392,421, a ratio of 3.9 to 1.

ASSOCIATED GAS CUTS PRICE OF ALLOTMENT CERTIFICATES.—Reduction in the price at which the $8 interest bearing allotment certificates of the Associated Gas & Electric Company will be offered to stockholders under rights from $133 to $120 has been announced. This action was taken in view of the recent decline in the security markets. It was also announced that the amount of the $5 dividend preferred stock included in each allotment certificate would be increased from one-fifth of a share to one-half share. The original offering was made to stockholders of record October 31. The $8 interest bearing allotment certificates include, in addition to one-half share of Associated Gas & Electric $5 dividend preferred stock, five shares of new General Gas & Electric Corporation common stock, class A, which is traded in on a when-issued basis on the Curb Exchange, and the old stock on the New York Stock Exchange and five new rights to purchase class A and common stock of the Associated Gas & Electric Company.

September Central Station Revenue Up 9 per Cent

Earnings, $170,100,000, Exceed Those of August by $6,700,000—Records Broken for This Season of the Year—Output, 7,618,120,000 Kw.-Hr., Shows Increase of 10 per Cent

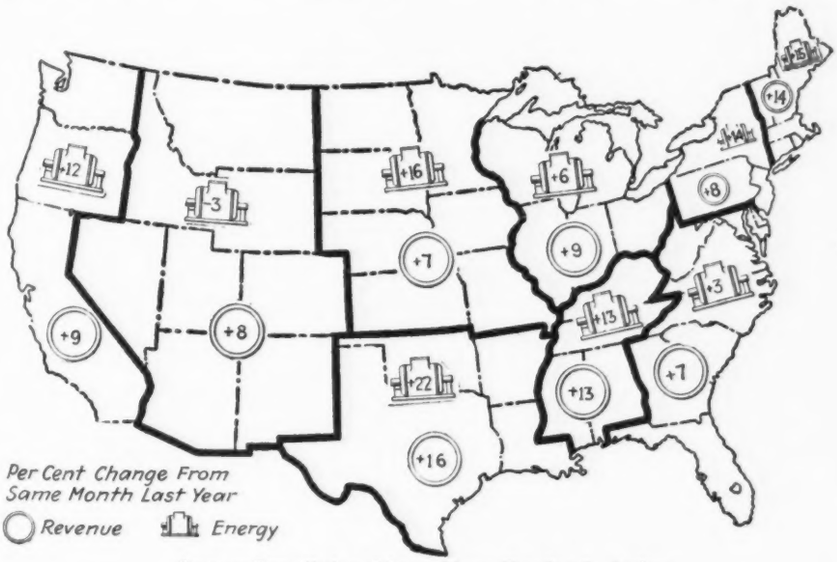
WITH September earnings of $170,100,000 for the entire electric light and power industry in the United States, as indicated in reports received by ELECTRICAL WORLD, records for the month were again broken, the figure for last year being exceeded by 9 per cent. The total constitutes an increase over earnings for August of $6,700,000, the rise being in line with the usual seasonal growth. The estimated total of expenditures, $72,250,000, was approximately the same as in August and 9.9 per cent greater than in September of 1928. The energy output, 7,618,120,000 kw.-hr., was about 276,000,000 kw.-hr. less than in August, owing to the shorter month and a holiday, but was 10 per cent greater than a year ago.

The scarcity of water power, increasingly serious during the summer, became so severe that in September only 31 per cent of the total output was generated hydraulically, the amount being 12 per cent less than in the corresponding month last year. It entailed an increase of 24 per cent in the output from fuel-burning plants, which were called upon to produce 5,237,589,000 kw.-hr.

Compared with the August production hydro-electric energy fell short by 356,000,000 kw.-hr. and an increase of 80,000,000 kw.-hr. had to be provided by the thermal plants.

After gains of 13 or 14 per cent over 1928 in the earlier months of the year, this increase of only 10 per cent might be assumed to indicate a decided slackening in speed. This does not necessarily follow. The early part of 1928 was normal, compared with the growth in former years; the latter part of the year was decidedly above normal, as shown on the accompanying chart.

The rise was maintained through August of the present year, and the lack of increase in average daily output in September is similar to what oc-



September Gains Show New England Active

Table I—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

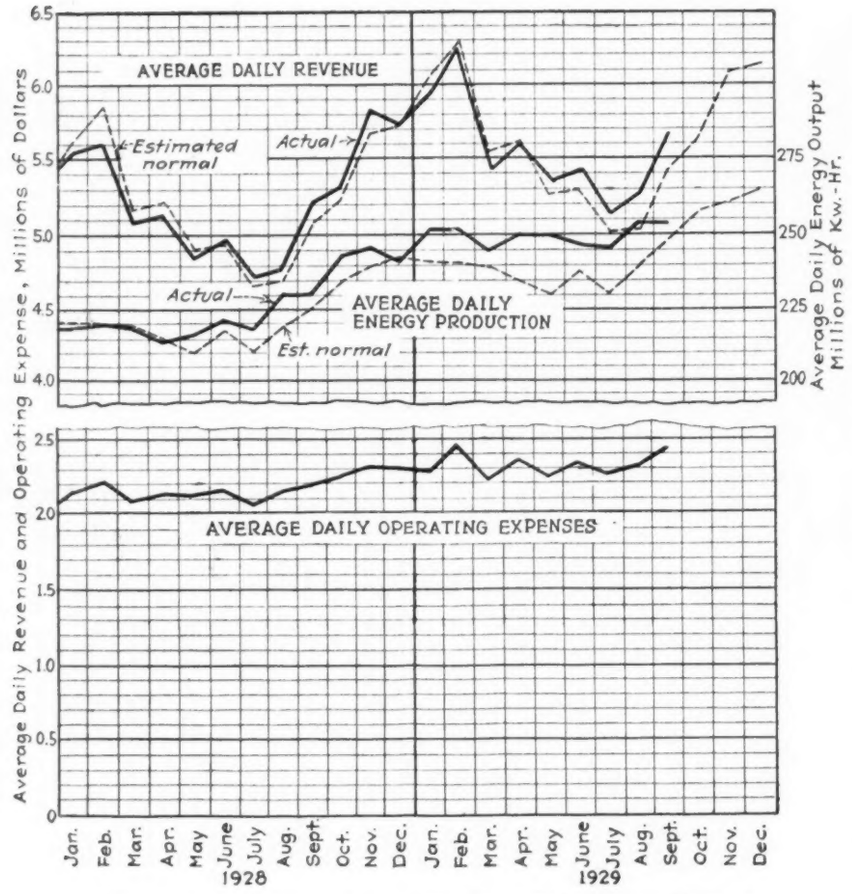
Month	Total Gross Revenue from Sale of Energy*			Total Operating and Maintenance Expense†		
	1929 Thousands	1928 Thousands	Per Cent Inc.	1929 Thousands	1928 Thousands	Per Cent Inc.
June	$162,500	$149,599	+ 8.7	$69,900	$64,800	+7.9
July	159,500	146,600	+ 8.8	70,100	64,100	+9.4
August	163,400	148,600	+10.2	72,150	66,600	+8.5
September	170,100	156,100	+ 9.0	72,250	65,750	+9.9

Table II—Central-Station Fuel Consumption in the United States‡

Compared with Corresponding Month of Previous Year

Month 1929	Coal		Oil		Gas	
	Short Tons	Per Cent Increase	Barrels	Per Cent Increase	Thousands Cubic Feet	Per Cent Increase
June	3,136,366	+13.9	585,784	+22.8	8,804,287	+41.4
July	3,321,853	+15.4	670,580	+26.3	8,842,601	+27.0
August	3,603,557	+14.5	759,921	+28.9	10,272,553	+34.1
September	2,581,363	+14.2	810,780	+37.6	10,613,360	+33.5

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.
†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions. ‡As collected by U. S. Geological Survey.



Revenue and Energy Output Continue Well Above Normal

curred in 1928. It will require the returns for October before any inferences can be drawn as to whether there is, in fact, a tendency to slow down somewhat.

The larger outputs from fuel-burning plants were not reflected in a corresponding rise in fuel consumption; compared with August the coal consumed was slightly less, although 7 per cent more oil and 4 per cent more natural gas were used.

Regional gains are shown on the map and in Table IV. The revenue increase of 15 per cent in August in New England was almost duplicated by an increase of nearly 14 per cent in September, compared with 1928. The 22.5 per cent in the West South Central States was followed by 15.5 per cent in September. In other parts of the country the rate of gain did not depart widely from the general average.

Again, in energy output New England gained 15 per cent, as against 13 per cent in the preceding month, and the West South Central States 22 per cent, as against 21. Changes in other regions lead to the inference that large blocks of energy were transmitted from areas favorably situated with reference to fuel supply to those most severely afflicted by low water.

All but one of the nine geographical regions reported less hydro-electric output than a year ago, the deficiency ranging from 1 per cent in the Pacific States to 42 per cent in New England. The only increase occurred in the West South Central Division, where water power is of relatively little significance.

The exceptional increase in energy generated from fuel is evidence of the imperative necessity of having abundant steam reserve. Such figures as 54 per cent in New England, 82 per cent in East South Central States, 79 per cent in the Coast region and 22 per cent in the Middle Atlantic States suggest that in many systems all available plant capacity must have been operated.

Table III—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1929	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
June	7,406,772	+11.6	2,984,597	—0.8	4,422,175	+21.9	1,565,000	+6.1
July	7,644,617	+13.0	2,973,696	—0.1	4,670,921	+23.4	1,610,000	+8.2
August	7,894,182	+10.8	2,736,779	—7.2	5,157,403	+23.4	1,630,000	+8.2
September	7,618,120	+10.0	2,380,531	—12.1	5,237,589	+24.2	1,708,000	+14.0

Table IV—Regional Operations, Revenue and Energy Output in September, 1929

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	170,100	+ 9.0	7,618,120	+10.0	2,380,531	—12.2	5,237,589	+24.2
New England	16,700	+13.8	508,626	+14.7	105,483	—41.9	403,143	+53.9
Middle Atlantic	42,110	+ 7.5	1,869,496	+14.2	423,240	— 6.3	1,446,256	+21.9
East North Central	42,470	+ 9.0	1,806,062	+ 5.5	150,924	—24.6	1,655,138	+ 9.5
West North Central	14,220	+ 7.1	463,802	+15.8	102,958	—21.0	360,844	+33.6
South Atlantic	17,850	+ 6.8	881,143	+ 2.5	374,278	—20.7	506,865	+31.2
East South Central	6,130	+10.5	272,518	+12.9	193,745	— 2.2	78,773	+82.1
West South Central	9,760	+15.5	440,993	+21.5	2,347	+43.4	438,646	+21.4
Mountain	4,560	+ 7.6	320,628	— 3.3	261,873	—12.0	58,755	+72.4
Pacific	16,300	+ 8.7	1,054,852	+12.4	765,683	— 1.4	289,169	+78.5

*As collected by U. S. Geological Survey.

ELECTRIC STORAGE BATTERY COMPANY, Philadelphia, has been refunded $64,947 by the Bureau of Internal Revenue for overassessments of income and profits taxes in the years between 1919 and 1927.

MALONE UTILITY INCREASES CAPITAL.—The Malone Light & Power Company, Malone, N. Y., has filed a certificate in the office of the Secretary of State increasing the number of shares of its non-par value capital stock from 60,000 to 70,000 shares.

INGERSOLL-RAND COMPANY has declared an extra dividend of $1 per share and the regular quarterly dividend of $1 per share on the common stock, no par value, both payable December 2 to holders of record November 6. On June 1 last an extra cash distribution of $1.25 per share was made. On the latter date the regular dividend rate was increased from 75 cents to $1 per share quarterly.

TOKIO ELECTRIC LIGHT REPORTS INCREASED EARNINGS.—Tokio Electric Light Company reports for the year ended May 31 gross earnings of $50,875,071, at the average rate of exchange for the period, against $47,118,372 for the preceding twelve months, a gain of 7.9 per cent. Gross income available for interest, after deducting depreciation of $3,885,700, amounted to $24,103,983, or about 2.5 times interest. The balance for dividends, after all charges, was $14,569,565.

Business News and Market Conditions

Record Manufacturing Operations

REPORTS received by the ELECTRICAL WORLD from a large proportion of the electrical manufacturing companies indicate that a new record for rate of productive operations was established during October by the electrical manufacturing companies of the country. The October rate of operations was 5.9 per cent above the previous high mark set last June, 7 per cent over that reported for September and 31.7 per cent over that of October last year. The average rate of activity by these plants during the first ten months of the current year was 16 per cent above that recorded during the same period last year. There is every indication now that the electrical manufacturing industry will set an average rate of activity for the year 1929 as a whole of at least 12 per cent over 1928.

October, 1929	180.6
September, 1929	168.8
August, 1929	155.4
July, 1929	166.6
October, 1928	137.1
Average first ten months 1929	159.1
Average first ten months 1928	124.7

The reports on electrical energy consumption indicate that both the large and small electrical manufacturers are witnessing record rates of activity. The group of larger manufacturers recorded an average increase in operations during October of 4.4 per cent as compared with September and were operating on a plane 40.8 per cent above October last year. The group of smaller manufacturing plants recorded an increase of 8.4 per cent as compared with September and were operating at a rate 27.6 per cent over October, 1928.

The index of activity in the electrical manufacturing industry based on consumption of electrical energy stands at 180.6 for October as compared with 137.1 in October last year. Comparative indexes of productive activity for the period 1923-25 as 100 and adjusted for number of working days are shown in the accompanying table.

Street-Lighting Section of N.E.M.A. Formed

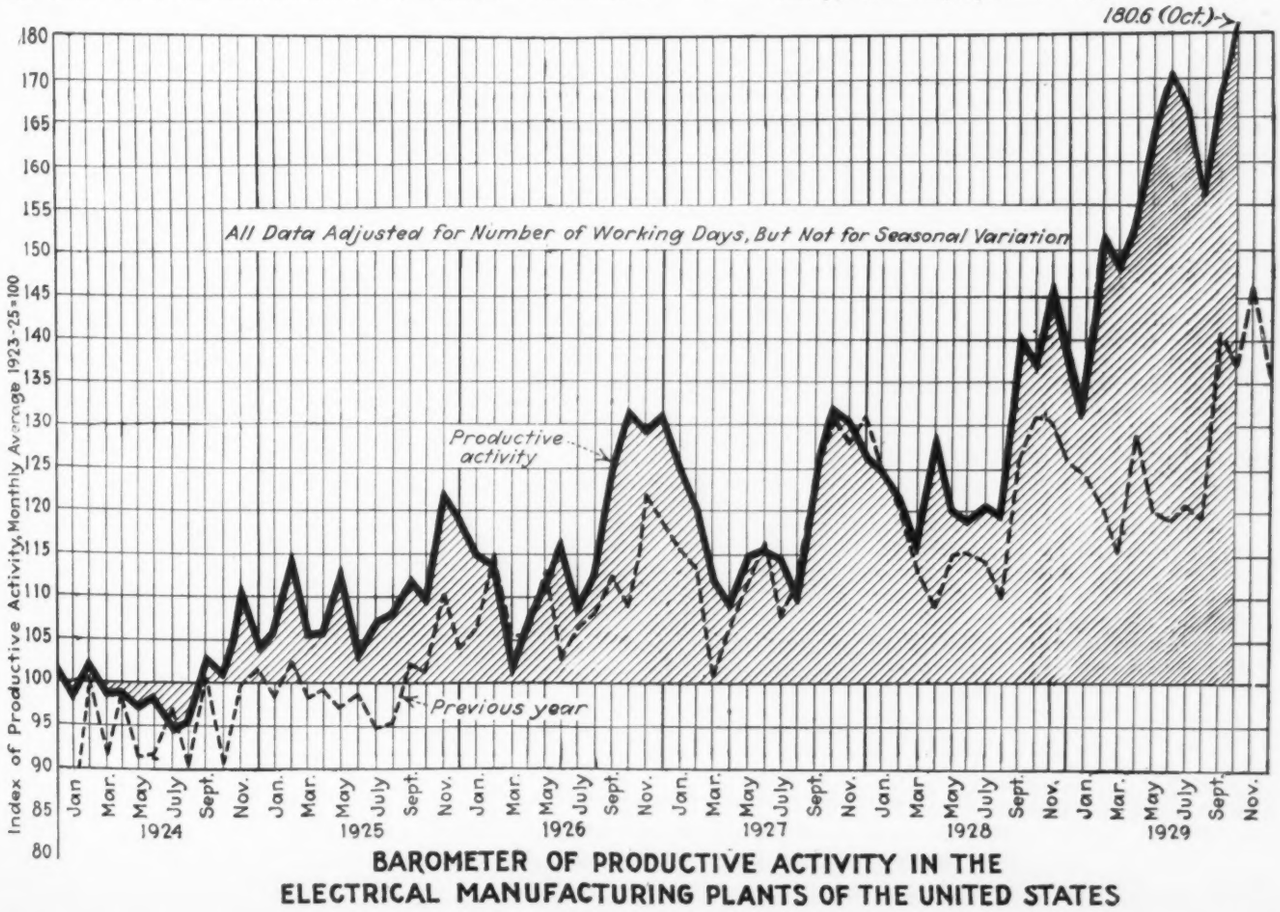
A street-lighting section, composed of six companies manufacturing standards and equipment for street lighting, was organized in the National Electrical Manufacturers' Association at a meeting held in the Cleveland Hotel, Cleveland, Ohio, on November 14. F. H. Winkley, General Electric Company, was elected chairman and L. A. S. Wood, Westinghouse Electric & Manufacturing Company, secretary.

The next meeting of the group is scheduled for the Book-Cadillac Hotel, Detroit, Mich., on December 18, at which time the members will discuss data giving a comparison of competitive types of street-lighting equipment, methods of determining costs of standards and the proper classification and collection of sales statistics. All manufacturers of this type of equipment are invited to attend.

The following manufacturing companies were represented at the organization meeting: Line Material Company, General Electric Company, Union Metal Manufacturing Company, Westinghouse Electric & Manufacturing Company, Wheeler Reflector Company and the Electric Railway Equipment Company.

New York Metal Market Prices

	Nov. 19, 1929 Cents per Pound	Nov. 26, 1929 Cents per Pound
Copper, electrolytic	18	18
Lead, Am.S. & R. price	6.25	6.25
Antimony	8⅛	8⅛
Nickel, ingot	35	35
Zinc, spot	6.25	6.50
Tin, Straits	40.00	41.75
Aluminum, 99 per cent.	24.30	24.30



BAROMETER OF PRODUCTIVE ACTIVITY IN THE ELECTRICAL MANUFACTURING PLANTS OF THE UNITED STATES

Market Conditions

RESULTS of the stock market crash are just now being reflected in the electrical equipment market throughout the East. As already reported, this is blamed also for holding up orders on the Pacific Coast.

——ELSEWHERE BUSINESS seems to be about normal.

——MOTOR SALES are especially active in New England and the railroads are responsible for substantial buying in the Middle West.

EASTERN

IMMEDIATE RESULTS of the violent decline in the value of securities are now being reflected in the electrical equipment market in the Eastern district and the close of the month shows a marked change in the situation. The reaction has developed within a week.

TEN LEADING manufacturers all report reduced commitments and a noticeable decline in inquiries, but all, as a unit, are optimistic for a rapid revival.

EVERY BRANCH of the industry is affected in this section, according to a careful survey of the situation.

An outstanding development of the week, indicating early revival of industrial demand, is the immediate expansion programs of iron and steel mills. The American Steel & Wire Company, Cleveland, Ohio, will build additions to plant at Donora, Pa., to cost $5,000,000, all machinery to be electrically operated. The National Steel Company will expand its Great Lakes steel mills at Detroit, Mich., to an amount of $25,000,000 and will build additions to the plant of its Weirton Steel Company unit at Weirton, W. Va., to cost $7,000,000. The National Tube Company, Pittsburgh, Pa., is making excavations for open-hearth, seamless tube and bar mills at McKeesport, Pa., to cost $20,000,000. The Illinois Steel Company, Chicago, will carry out an expansion and betterment program at mills at South Chicago and Gary, Ill., to cost more than $150,000,000.

A manufacturer of heavy electrical machinery expresses the opinion that the present recession is of temporary character and that the turn of the new year will bring about desired revival. A power company in northern New York has placed an order for transformers, switchgear and auxiliary equipment to cost about $85,000. A central station in Connecticut has contracted for transformers totaling $35,000. A power utility in Michigan has given a commitment for similar apparatus to cost $100,000. An award for generators for a new central station in Louisiana has been placed with a Pennsylvania manufacturer, the order for boiler units, including preheaters and superheaters, going to a New York maker, while contract for oil circuit breakers and kindred equipment has been taken by a Massachusetts manufacturer; this project will involve upward of $2,000,000. A manufacturer of motors reports demand as quiet, and says that business for November is rounding out below that of the same month of last year, while the gross sales of 1929 far exceed those of 1928; demand from industrial interests has reached a low point. A producer of electrical specialties, including fuses, etc., states that trade is very poor in immediate commitments, but that inquiries indicate an improvement in the situation within thirty days. Electric railway account continues to give promise and does not show indication of any curtailment; the Pennsylvania Railroad Company has entered the market for 150 electric locomotives for its electrification program, to be built over a period of months, estimated to cost approximately $16,000,000.

CONSTRUCTION PROJECTS

P. Ballantine & Sons, Newark, N. J., beverages, have filed plans for a multistory factory on Washington Street, New York, to cost $850,000. Dornier Corporation of America, Inc., an interest of the General Motors Corporation, New York, plans plant for manufacture of flying boats, reported to cost more than $400,000. Bell Telephone Laboratories, New York, plan laboratory units and experimental radio research station at Holmdel, N. J. Richfield Oil Corporation, New York, will build a storage and distributing plant at Schenectady, N. Y., and a series of such plants along the New York State Barge Canal, each to cost about $100,000. Johns-Manville Corporation, New York, has approved plans for addition to asbestos and insulating products plant at Manville, N. J., to cost about $250,000. Jersey Central Power & Light Company, Asbury Park, N. J., has superstructure under way for proposed steam-operated generating station on the waterfront at South Amboy, N. J., to cost $5,000,000, and will make extensions in transmission lines. Grinnell Company, Providence, R. I., has authorized plans for a heater and sprinkler manufacturing plant at Philadelphia, Pa., to cost $150,000. Artcraft Silk Hosiery Company, Philadelphia, Pa., will build an addition to cost $50,000. Viscose Company of America, Inc., Marcus Hook, Pa., has superstructure in progress for an addition to rayon mill at Roanoke, Va., to cost $150,000. Delaware Power & Light Company, Wilmington, Del., plans additions to power substations at Christiana and Brandywine, and additional transmission lines to cost $670,000, and will make other extensions and improvements, including distributing lines, to cost $550,000. Potomac Edison Company, Hagerstown, Md., plans additions in transmission lines at Cedar Grove, Woodfield, Clarksburg and vicinity. Supervising architect, Treasury Department, Washington, D. C., will receive bids until December 6 for circuit breakers, etc., for United States Mint, Philadelphia, Pa. General Purchasing Officer, Panama Canal, Washington, D. C., will receive bids until December 11 for insulated wire and cable, switches, fuses and electrical supplies (Panama Circular No. 2510). Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until December 10 for electric soldering irons, electric glue pots, electric flat irons, etc. (Schedule 2290), and at the same time for a quantity of storage batteries (Schedule 2289.)

SOUTHWEST

STEADY buying of apparatus for industrial plants continues, with no appreciable decrease.

THE FAVORABLE cool weather has caused the sales of appliances to increase 100 per cent. Sales of radio apparatus have been exceptionally large during the past week.

Manufacturers have been figuring on a very large order of electrical equipment for the Osage River water-power development, but they now state that owing to some contemplated changes the letting of the contracts has been postponed. The only contracts reported are for totalizing demand meter equipment for an east side power company to cost $8,000 and for a local company additional lighting arresters costing $9,000.

CONSTRUCTION PROJECTS

Kansas City Power & Light Company, Kansas City, Mo., plans power substation to cost $60,000. Phoenix Sand & Gravel Company, Bagnell, Mo., plans plant on local site reported to cost close to $40,000. Kansas City, Kan., plans extensions and improvements in municipal electric power plant, including additional equipment, and will build power substation on Parallel Street. Kansas Power & Light Company, Topeka, Kan., will proceed with addition to power plant at Tecumseh, Kan., to increase capacity by 55,000 kw., and will make extensions in transmission lines. Oklahoma Gas & Electric Company, Oklahoma City, Okla., will install ornamental lighting system at Madill, Okla. Alexander Drug Company, Oklahoma City, Okla., plans plant to cost $350,000. Merchants' Grocery Company, Blytheville, Ark., plans cold storage and refrigerating plant to cost $25,000. Southwestern Gas & Electric Company, Shreveport, La., plans cold storage and refrigerating plant at Waldron, Ark., reported to cost about $40,000. Texas Water Utilities Company, Fort Worth, Tex., plans cold storage and refrigerating plant at Gorman, Tex., reported to cost $30,000. Southwestern Public Service Company, Amarillo, Tex., plans extensions and improvements in power plant at Pampa, Tex., including installation of additional equipment. Central Power & Light Company, Frost Building, San Antonio, Tex., has plans for a cold storage and refrigerating plant at San Benito, and ice-manufacturing plant at Raymondville,

reported to cost $75,000. Southern Bag & Burlap Company, Houston, Tex., plans an addition to cost about $100,000. Austin, Tex., plans floodlighting system and beacon lamps for municipal airport to cost $75,000. Longview, Tex., plans installation of street lighting system. Minden Cotton Oil & Ice Company, Minden, La., contemplates commercial fertilizer manufacturing plant, reported to cost $75,000. Alexandria, La., plans installation of floodlighting system and beacon lamps at proposed municipal airport.

Pacific Coast

PROSPECTS are good for all branches of electrical industry, but two factors are holding up actual orders: First, heavy market slump in power and industrial stocks; second, lack of rain, reservoirs having reached record lows with no storage snow on Sierra Nevada. This factor is very serious.

Machinery companies are figuring on a 4,800-hp. hydro plant for Merced Falls, approximate value $200,000, and about $500,000 worth of distributing transformers, equally divided between north and south. Westinghouse reports sale of $110,000 dredge equipment in San Francisco and a carload of high-tension insulators in Los Angeles territory. Railroad business includes a carload of glass insulators and $20,000 worth of lead telephone cable. Power company orders include three carloads of crossarms, $5,000 worth of 1,000,000-circ.mil lead cable and many scattered orders for construction tools. Export business is fair, the outstanding order covering 1,000,000 ft. of telephone distributing wire for the Philippines. Prospective business covers cable, poles and hardware for the naval ammunition plant in Nevada, a $21,000 award for Oroville's fire alarm system, dirigible and bombing bases for the U. S. Government, a $2,000,000 dormitory for the state university at Berkeley and street-lighting extensions for Auburn and Gustine. Prices on all standard wiring supplies are steady, with 5 per cent increases in schedule material. Coast stocks are in good shape. Collections are very good, with the usual holiday credit increases. Retail business is still cautious and problematical. An outdoor Christmas tree lighting campaign has been launched and is expected to result in a state-wide sale of 30,000 outfits.

Following two weeks' activity in the motor market, when numerous machines were sold to mill machinery manufacturing companies and lumber mills for installation during the annual Christmas shutdown, the movement last week in the Puget Sound district dropped to a minimum, indicating that this year's motor buying is about over. Central station buying, also, was light, and this condition, authorities state, will probably prevail until well after the first of the new year. Christmas buying of electrical merchandise, it is generally agreed, is and will be from fair to good, comparing favorably with last year, this despite stock market disturbances. Range sales are well sustained and other household appliances are reported moving well. Central station buying in the Seattle district included about $5,000 worth of high-voltage switchgear equipment, a few 5, 7½ and 10-kva. distribution transformers, some suspension insulators, busbar equipment and a small order of 66-kva. insulators for the southern district. Motor sales reported included 30 machines from 15 hp. down to a lumber mill near Portland, fifteen machines from 60 hp. down for a mill in the Puget Sound section and about 40 machines from 100 hp. down to mills and allied industrials from scattered sources. Bids were opened for about $18,000 worth of motors for a grain elevator for the city of Tacoma, but the award was not made. Pacific Telephone & Telegraph Company has announced a $10,000,000 construction program for the state of Washington during 1930, an increase of nearly $3,000,000 for the state's 1929 expenditures. Throughout the entire Pacific Northwest during the year, it is stated, approximately $16,000,000 will be spent.

CONSTRUCTION PROJECTS

Southern Pacific Railroad Company, Los Angeles, Calif., has filed plans for a one-story power plant to cost about $50,000. Long Beach, Alameda, El Cerrito, Redlands, and San Jose, Calif., plan ornamental street-lighting systems. Pacific Lumber Company, Scotia, Calif., will build an addition to mill to cost $350,000. Oakland, Calif., is taking bids until December 5, for municipal shops to cost $80,000. Western Products Company, Salem, Ore., plans paperboard mill to cost $200,000. Pendleton, Ore., plans ornamental lighting system. Puget Sound Power & Light Company, Seattle, Wash., has approved plans for an addition to generating station at Renton, Wash., to cost $3,000,000. Laurel Oil & Refining Company, Laurel, Mont., plans oil refining plant to cost $1,000,000. Great Northern Railway Company, St. Paul, Minn., has approved plans for car shops at Great Falls, Mont., to cost $140,000. Caldwell, Idaho, plans ornamental lighting system.

New England

STEADY SALES of scheduled material and electric motors continue in this district.

NEGOTIATIONS for heavy equipment are under way by paper companies and textile industries, but some slackening off in central-station equipment and new construction materials is noticeable.

MERCHANDISING continues and encouraging gain in volume over that of last year is reported in general.

During the past week motor sales by one manufacturer reached about $30,000. Another manufacturer reports active demand for fractional-horsepower motors. Tool makers are ordering small motors in small lots. Heavy duty motor sales are limited to single orders. Small switch and control equipment sales during the past week were steady. New construction material, according to one prominent jobber, is much less active. Industrial electric furnaces are being considered by machine tool manufacturers and orders are under consideration. Electric arc-welding units are attracting interest. Central station supply buying is limited to stocking up for equipment to meet the coming seasonal demands. New line construction and expansion of distribution systems is promising in view of recent statements made by the head of a prominent New England power company that about $20,000,000 will be expended during the coming year for power development and distribution in this district. Merchandising in this district, according to reports covering about fifteen central stations in Massachusetts, shows about 20 per cent increase in volume over that recorded for last year.

CONSTRUCTION PROJECTS

Hood Rubber Company, Watertown, Mass., has filed plans for an addition to cost close to $60,000. Highland Ice Company, Hartford, Conn., will build an addition to ice-manufacturing plant to cost about $40,000.

Middle West

SOME SLIGHT acceleration in general business was noticeable this week in the Middle West section.

REPORTS from the agricultural sections indicate favorable conditions, while mail order sales continue to show an increase. The major activities are on a stable basis and a feeling of optimism is quite generally expressed.

RAILROADS have spent and are expending huge sums for equipment and maintenance, while the utility companies are planning to increase their commitments substantially. Car loadings are high and well diversified.

Some of the interesting orders placed this week include nine 2,000-kva. oil-insulated, self-cooled, single-phase, 60-cycle power transformers, three 88-kva., 1,200-amp., single-pole, single-throw wheel-mounted oil circuit breakers, 66 25-cycle two second definite minimum inverse time-limit overcurrent relays, "Mazda" lamps valued at $150,000 and several construction orders aggregating $100,000.

Jobbers' sales are normal for this period of the year. The coming holiday season necessitates large purchase of appliances and the demand for cold weather appliances is good. Considerable business is being obtained from railroad and municipal sources, while general sales for the year are approximately 25 per cent ahead of the same period last year.

CONSTRUCTION PROJECTS

Muskegon Traction & Lighting Company, Muskegon, Mich., plans expansion and improvement program in 1930, to cost $350,000. Public Lighting Commission,

Detroit, Mich., plans power substation to cost $100,000. National Battery Company, St. Paul, Minn., is reported planning eastern plant in vicinity of Detroit, Mich., to cost more than $200,000. South Haven, Mich., plans extensions and improvements in municipal power plant to cost $40,000. Combustioneer, Inc., Cicero, Ill., plans automatic furnace manufacturing plant at Dayton, Ohio, to cost $200,000. Public Service Company of Northern Illinois, Chicago, Ill., has authorized erection of superstructure for an addition to power plant at Waukegan, Ill., reported to cost $300,000. Central Illinois Public Service Company, Springfield, Ill., plans office and operating building to cost more than $500,000. University of Illinois, Urbana, Ill., plans addition to chemistry building to cost $325,000. Rubel Baking Company, Cincinnati, Ohio, has filed plans for baking plant to cost $250,000. Columbia Metal Stamping & Die Company, Cleveland, Ohio, has filed plans for an addition to cost $150,000. Minnesota Power & Light Company, Duluth, Minn., plans transmission line to Wrenshall, Minn., and vicinity. New Ulm, Minn., plans ornamental street-lighting system. Twin City Wholesale Grocery Company, St. Paul, Minn., plans storage and distributing plant to cost $150,000. Grant Storage Battery Company, Minneapolis, Minn., will build plant to cost $100,000.

SOUTHEAST

ELECTRICAL INTERESTS in the Southeast report business as holding up satisfactorily, and while few large individual orders are being placed at the present time no pessimism is being expressed over the outlook for the winter business.

A Georgia power company placed last week two orders for motors aggregating $54,000 for installation in a new steam station. Automatic switching equipment amounting to $10,500 was ordered for a North Georgia substation job and another interesting order was for 275,000 lb. of weatherproof copper wire. Some other central station orders were for $6,100 worth of lead-covered cable, $6,000 worth of creosoted pine poles and distribution and small power transformers amounting to $5,400. A cotton mill in middle East Georgia purchased motor equipment last week totaling $16,000 in connection with a partial electrification project.

CONSTRUCTION PROJECTS

Appalachian Electric Power Company, Roanoke, Va., plans extensions and improvements in street lighting system at Charleston, W. Va. Pound River Electric Company, Pound, Va., recently organized, plans electric light and power plant to cost more than $50,000. Memphis, Tenn., has authorized floodlighting system, projection lamps, boundary lamps and other lighting facilities for municipal airport, with control system, to cost $25,000. Chamber of Commerce, Memphis, Tenn., is at head of a project for an ornamental lighting system on a number of streets. Nashville, Chattanooga & St. Louis Railway Company, Nashville, Tenn., plans addition to shops and terminal at Nashville, reported to cost $50,000. Booneville, Miss., plans extensions in street lighting system. Jacksonville, Fla., will receive bids until Dec. 9 for transformers, switchboard apparatus and other equipment for power substation.

Activities of the Trade

Federal Neon System Results from Merger of Units

WITH the flotation this week of a $10,000,000 stock issue the Federal Neon System, Inc., stated to be the largest firm operating in the luminous tube industry, is launched. The proceeds of the issue will be used to purchase the assets of the Federal Electric Company which pertain to the electrical advertising and Neon tube divisions, it is announced by Charles V. Bob & Company.

Through an exchange of stock the company will acquire control of both Rainbow Luminous Products, Inc., and the National Neon Agency. The sale of the controlling interest in these companies to Federal Neon System, Inc., has been approved by the directors of both organizations and the directors of Federal Electric Company have also approved the sale of its electrical advertising and Neon tube business to Federal Neon System, Inc., it is stated.

The roster of officers and directors of the new corporation will include names prominent in the electrical industry. G. L. Johnson is chairman of the board, Charles Borland president and Charles Cason secretary and treasurer. The permanent board of directors has not yet been named, but will be chosen in part from present directors of the consolidated companies.

Federal Neon System, Inc., has been organized with an authorized capital of 1,000,000 shares of no-par class A stock, of which 400,000 shares will be presently outstanding, and 3,000,000 shares of no-par common stock, of which 2,400,000 shares will be outstanding. The financing will consist of 400,000 units, each unit being composed of one share of class A stock and one share of common.

Insull Not in Merger

It is reported that a statement has been made by Samuel Insull that neither he nor his immediate associates will be members of the board of directors of the Federal Neon System, Inc., whose securities are now being offered by Charles V. Bob & Company.

Claude Neon Lights Denies Connection with Merger

A statement has been issued by W. T. P. Hollingsworth, president of Claude Neon Lights, Inc., and R. L. Kester, Jr., vice-president, denying that Claude Neon Lights has authorized the association of its name or those of any of its officers with the flotation of shares of Federal Neon System, Inc. No officer or director of Claude Neon Lights has agreed to serve on the Federal Neon board of directors, according to the statement, and there has been no settlement or compromise of the litigation which Claude Neon Lights has brought against Federal Electric, George L. Johnson and Rainbow Luminous Products to restrain the proposed transfer of the stock of Claude Neon Federal Company.

Mr. Hollingsworth and Mr. Kester state that the contract between Claude Neon Lights and Federal Electric prohibits consolidation of Claude Neon Federal Company with any other concern without the consent of more than 75 per cent of the outstanding common stock of Claude Neon Federal Company. Claude Neon Lights owns sufficient of this stock to prevent the consolidation says the statement.

Westinghouse Receives Panelboard Order

An order for 25 type "NAB Nofuz" panelboards totaling approximately 450 circuits was received by the Westinghouse Electric & Manufacturing Company from the United Engineers & Constructors, Inc., for use in the Chesapeake & Ohio Railway Company building at Huntington, W. Va. This order marks one of the first applications of these panelboards in the railway field. "Nofuz" panelboards are equipped with circuit breakers instead of the conventional switch and fuse for controlling the branch circuits. This device gives the greatest safety and convenience because, according to the manufacturer, there are no fuses to be changed when service is interrupted by an overload or short circuit.

ALLIS-CHALMERS MANUFACTURING COMPANY, Milwaukee, announces the appointment of the T. B. Wood's Sons Company, Chambersburg, Pa., as special distributor for "Texrope" drives.

R. H. GEISER COMPANY, St. Louis, Mo., has been organized with the full financial support of the North American Electric Lamp Company of that city, to promote the sale of electrical products in southern Illinois, Missouri, Kansas and Arkansas.

GENERAL ELECTRIC SUPPLY CORPORATION, formerly the Pacific States Electric Company, formally opened its new home for the Seattle branch located at 1212 First Avenue, South, on November 4. The new structure, which occupies more than 60,000 sq.ft. of floor space, houses the offices, warehouse, display and service rooms and is equipped in a modern manner. D. E. Harris, vice-president Western region, with headquarters in San Francisco, was present. A. J. Lutz is Seattle division manager.

New Equipment Available

Single-Phase Capacitor Motors

A line of single-phase, squirrel-cage capacitor motors, designated type KC, especially designed for quiet operation is announced by the General Electric Company. These motors are expected to find their principal application driving blowers and ventilating fans in buildings, on low-torque centrifugal machinery, on low-pressure pumping applications, on some woodworking machines and machine tools where the motor is built into the machine.

Although the motor is classified as a single-phase machine, it is really a modified two-phase, squirrel-cage motor with a capacitor in series with one phase of the stator windings. This gives starting characteristics similar to the two-phase, squirrel-cage motor; that is, it is self-starting. The capacitor remains in the circuit throughout starting and running so that full-voltage hand or magnetic control only is required. As a result of this, single-phase pulsation is absent. In addition special slot combinations and rotor construction are used to obtain an even greater degree of quietness than would otherwise be possible.

The ratings available in the new line are from 1 to 25 hp., inclusive, at 3,600, 1,800, 1,200 and 900 r.p.m. constant speed, with starting torque from 60 to 40 per cent of full-load running torque depending upon speed. Maximum torque is approximately 20 per cent of full-load running torque.

Splash-Proof Across-the-Line Starting Switch

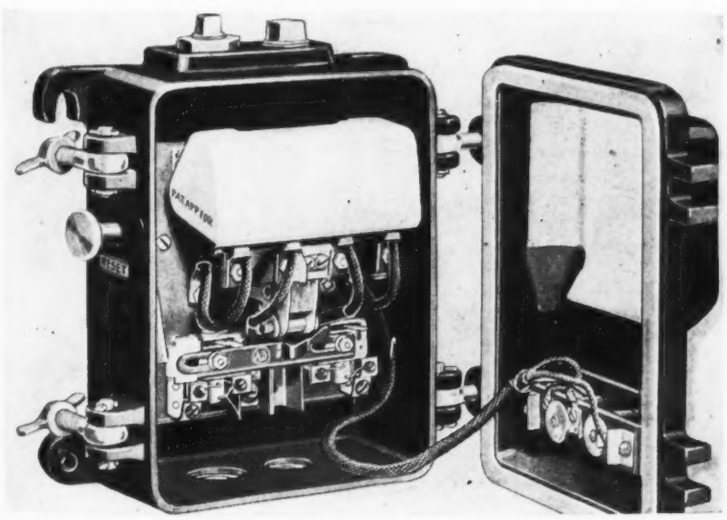
A splash-proof across-the-line starting switch for a.c. motors used where excessive moisture or dust is present is announced by the Allen-Bradley Company, Milwaukee. The distinguishing feature is the special waterproof cabinet, which is made of cast iron and provided with a cover gasket to exclude moisture and dust. The one-piece arc hood, it is claimed, effectively prevents flashovers when the switch disconnects an overloaded motor. The light-weight but rugged switch arm, with quick-acting copper-to-copper contacts, prevents sticking and welding of contacts.

This switch is rated up to 3 hp., 110 volts, and 5 hp., 220 volts, for single-phase motors and up to 5 hp., 220 volts, and 7½ hp., 440 to 550 volts, for polyphase motors. It is furnished with push buttons in covers, also for external pilot control and with two-way lever switch.

Flush Type Strip-Chart Flow Recorder

The greatest objection to flush type instruments has been the inaccessibility of the internal parts. This has been eliminated in flow meters, according to the Brown Instrument Company, Philadelphia, by mounting the entire mechanism on a carriage which can be drawn out from the case. With the recording mechanism drawn out the changing of the chart rolls and inspections are easily made. If it is necessary to inspect the interior the removing of two screws allows the entire recording mechanism to swing to the left, exposing all of the interior. When in an operating position a locking device holds the mechanism firmly in place.

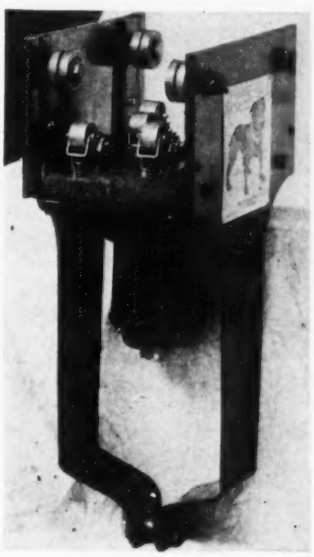
This meter can be supplied as a single or duplex recording instrument. Types available record flow, two flows, flow and temperature, or flow and pressure. It can also be equipped with a chart reroll when monthly records are to be kept as one continuous record. It is also supplied as an automatic controller for the flow of air, gas, water, oil or steam. The chart speed is 1 in. per hour and a single chart roll is sufficient for 30 days record.



Provides Flexibility of Connection in Industrial Plants

For serving portable tools along assembly lines in mass-production plants the Bulldog Electric Products Company of Detroit has just announced its trolley-duct and bus-duct system. It is particularly adapted to installations where frequent and rapid changes in location of machines, motors and sometimes whole departments are desired on short notice.

The bus duct consists essentially of



insulated busbars inclosed in a metal trough or duct equipped with bakelite receptacles connected to the busbars at regular intervals for the reception of fusible switch plugs. These, in turn, are connected to the motor or machine they control by flexible cable. When a machine's location is changed the fusible switch plug goes with it and is plugged into a receptacle in the bus duct at the new location.

The trolley duct consists essentially of standard lengths of 5-in. inverted steel channel, the top part of which constitutes the track for the trolley carriage. Attached to the bottom of the channel is an insulated busbar. Current is taken from the busbars by means of collector wheels in the trolley carriage and conveyed through fuses to the cord connecting the individual portable tools.

BAKELITE ROTATING UNIT FOR OIL CIRCUIT BREAKERS.—Maximum mechanical and dielectric strength is insured in the line of 11-kv. to 220-kv. oil circuit breakers made by the Pacific Electric Manufacturing Company, 5815 Third Street, San Francisco, by a recent improvement in design, according to the manufacturer. Bakelite is now used to support the rotating contact assembly in this advanced line of breakers.

Electrical Patents

Announced by U. S. Patent Office

(Issued October 29, 1929)

1,733,810. CASCADE CONNECTED ASYNCHRONOUS ELECTRICAL MACHINE; P. Letrilliart, Paris, France. App. filed June 15, 1928.

1,733,812. WIRE FEEDING MECHANISM FOR ARC WELDING MACHINES; M. L. MacRae, Schenectady, N. Y. App. filed Nov. 29, 1927.

1,733,817. INDICATING APPARATUS; J. S. Moranor, Castleton, N. Y. App. filed April 7, 1927.

1,733,835. WIRE-FEEDING MECHANISM FOR WELDING MACHINES; C. Steenstrup, Schenectady, N. Y. App. filed Nov. 23, 1927.

1,733,836. WIRE FEEDING MECHANISM FOR WELDING MACHINES; C. Steenstrup, Schenectady, N. Y. App. filed Nov. 23, 1927.

1,733,840. TERMINAL-BOX SUPPORT; F. A. Tefft, Toledo, O. App. filed Nov. 3, 1924.

1,733,853. AUTOMATIC RECLOSING CIRCUIT-BREAKER SYSTEM; A. E. Anderson, Scotia, N. Y. App. filed Nov. 29, 1926.

1,733,861. ELECTRIC-CIRCUIT CONNECTER; G. Carlson, Ansonia, Conn. App. filed Dec. 30, 1927.

1,733,872. ELECTRIC MOTOR; R. C. Graseby, Westminster, London, England. App. filed Jan. 20, 1928.

1,733,881. AUTOMATIC MACHINE FOR MANUFACTURING ELECTRIC INCANDESCENT LAMPS AND SIMILAR ARTICLES; G. Illingworth, Cleveland Heights, O. App. filed Jan. 19, 1926.

1,733,882. METHOD OF AND APPARATUS FOR MOUNTING FILAMENTS; G. Illingworth, East Cleveland, O. App. filed Jan. 19, 1926.

1,733,885. VEHICLE SIGNAL DEVICE; W. H. Katt, Chicago, Ill. App. filed Feb. 18, 1927.

1,733,904. CIRCUIT-INTERRUPTING SYSTEM; D. C. Prince, Schenectady, N. Y. App. filed May 19, 1928.

1,733,922. METHOD OF WELDING COPPER BOILER ENDS; A. H. Trageser and L. Hassinger, New York, N. Y. App. filed Nov. 24, 1928.

1,733,944. SECONDARY CELL AND PARTS THEREOF; J. S. Crossley, Monee Ponds, Victoria, Australia. App. filed Nov. 26, 1926.

1,733,974. VARIOMETER; A. Nyman, Dobbs Ferry, N. Y. App. filed Sept. 8, 1926.

1,733,984. RHEOSTAT; R. M. Heintz, San Francisco, Calif. App. filed Oct. 2, 1923.

1,734,004. HORN-BUTTON SWITCH; L. Blackmore, Highland Park, Mich. App. filed Nov. 11, 1927.

1,734,015. PRESSURE-ACTUATED CIRCUIT CONTROL; I. E. McCabe, Chicago, Ill. App. filed Feb. 24, 1922.

1,734,016. PRESSURE ACTUATED CIRCUIT CONTROL; I. E. McCabe, Chicago, Ill. App. filed Sept. 1, 1922.

1,734,017. CIRCUIT CONTROLLER; I. E. McCabe, Chicago, Ill. App. filed Oct. 23, 1922.

(Issued November 5, 1929)

1,734,042. ROTARY TRANSFORMER; M. Moneyron, Paris, France. App. filed April 9, 1929.

1,734,056. STREET-LIGHTING FIXTURE; A. G. Steinmayer, Milwaukee, Wis. App. filed Dec. 27, 1926.

1,734,071. CIRCUIT-CONTROLLING DEVICE; J. L. Blalack, Los Angeles, Calif. App. filed July 18, 1927.

1,734,073. MULTIPLE ATTACHMENT PLUG; A. A. Canton and H. Becher, New York, N. Y. App. filed May 31, 1928.

1,734,075. WATER HEATER; H. W. Christian, Windsor, Ont., Can. App. filed Sept. 14, 1928.

1,734,084. DEVICE FOR INVESTIGATING AND ASCERTAINING THE DIGESTIVE ACTION OF THE STOMACH AND THE CHANGES OF ITS CONTENTS; C. Funck, Cologne-on-the-Rhine, Germany. App. filed March 18, 1929.

1,734,109. WATTLESS COMPONENT METER; W. Beusch, Zug, Switzerland. App. filed Dec. 16, 1925.

1,734,110. MEANS FOR CONTROLLING INDUCTION ELECTRICITY METERS; W. Beusch, Zug, Switzerland. App. filed Jan. 15, 1927.

1,734,145. ELECTRICAL CONNECTER; R. S. Piper, Chicago, Ill. App. filed April 3, 1925.

1,734,162. ELECTRIC-LAMP SOCKET; R. Eckstein, New York, N. Y. App. filed March 21, 1927.

1,734,167. SUSPENSION INSULATOR FITTING; H. R. Holmes, East Liverpool, O. App. filed July 7, 1926.

1,734,178. ELECTRICAL CONDENSER; F. W. McDonell, Brooklyn, N. Y. App. filed Jan. 21, 1926.

1,734,185. FLUID-LEVEL INDICATOR; T. Veitch, Brielle, N. J. App. filed Dec. 5, 1924.

1,734,187. ELECTRICAL CONNECTING AND SUPPORTING DEVICE; E. C. White, New York, N. Y. App. filed April 28, 1923.

1,734,190. CIRCUIT BREAKER; W. M. Austin, Pittsburgh, Pa. App. filed April 13, 1922.

1,734,193. METER DAMPING MAGNET; W. Beetz, Nuremberg, Germany. App. filed Jan. 27, 1927.

1,734,198. SYSTEM OF CONTROL; E. M. Bouton, East Pittsburgh, Pa. App. filed Oct. 14, 1924.

1,734,199. DAMPING SYSTEM; W. M. Bradshaw, Wilkinsburg, Pa. App. filed Dec. 24, 1927.

1,734,202. CABLE CONNECTOR; L. H. Church, Roselle, N. J. App. filed Feb. 4, 1927.

1,734,205. CONTROLLING MEANS; L. W. Eggleston, Buffalo, N. Y. App. filed June 4, 1923.

1,734,208. LIGHTNING-ARRESTER UNIT; L. R. Golladay, Wilkinsburg, Pa. App. filed Jan. 20, 1923.

1,734,211. RENEWABLE FUSE; J. Johnson, Fort Frances, Ont., Can. App. filed May 14, 1928.

1,734,217. OSCILLOGRAPH; J. W. Legg, Wilkinsburg, Pa. App. filed Oct. 10, 1925.

1,734,220. ELECTRICAL MEASURING INSTRUMENT; P. MacGahan, Orange, N. J. App. filed March 6, 1928.

1,734,226. LIGHTING SWITCH; H. E. Norviel, Anderson, Ind. App. filed June 13, 1927.

1,734,227. LIGHTING SWITCH; H. E. Norviel, Anderson, Ind. App. filed June 13, 1927.

1,734,229. ELECTRICAL MEASURING INSTRUMENT; E. G. Ratz, Hamilton, Ont., Can. App. filed Dec. 9, 1927.

1,734,230. COMBINED SEARCHLIGHT AND FUSE TESTER; N. Roe, Patchogue, N. Y. App. filed Jan. 27, 1928.

1,734,233. AUTOMATIC ELECTRIC-CIRCUIT MAKE AND BREAK DEVICE; J. Shannon and H. Shannon, Florence, Mass. App. filed May 9, 1927.

1,734,235. LIGHTNING ARRESTER; J. Slepian, Swissvale, Pa. App. filed April 21, 1924.

1,734,239. SYNCHRONIZING RELAY SYSTEM; P. Thomas, Edgewood, Pa. App. filed Sept. 23, 1927.

1,734,245. APPARATUS FOR GENERATING ELECTRICITY; Q. V. Distefano, Waterbury, Conn. App. filed July 7, 1927.

1,734,299. IGNITION MECHANISM; J. N. Macrae, Stamford, Conn. App. filed May 12, 1928.

1,734,309. ELECTRIC RESISTANCE MATERIAL; T. A. Swartz and W. P. Uhler, Tottenville, N. Y. App. filed Sept. 24, 1923.

1,734,322. SWITCH BOX; E. G. Appleton, Chicago, Ill. App. filed March 16, 1928.

1,734,335. ELECTRIC LIQUID HEATER; A. Martin, Ogdensburg, and F. H. Finnegan, Wanakena, N. Y. App. filed Sept. 15, 1927.

1,734,342. APPARATUS FOR THE DETECTION AND ESTIMATION OF IMPURITIES AND DISSOLVED MATTER IN WATER AND OTHER FLUIDS; C. E. Perry, London, England. App. filed April 8, 1927.

1,734,348. TIRE ALARM; V. E. Rouch, South Bend, Ind. App. filed July 12, 1926.

1,734,350. MAGNETO; A. Schreil, Milwaukee, Wis. App. filed Nov. 8, 1926.

1,734,382. RADIATING ELEMENT FOR ELECTRIC HEATERS; H. R. Humphrey, Kalamazoo, Mich. App. filed May 28, 1927.

1,734,419. ELECTRICAL VALVE ACTUATION; W. C. Chitty, Bayonne, N. J. App. filed Jan. 12, 1927.

1,734,432. ELECTRICAL CONNECTION; C. F. Goudy, Flushing, N. Y. App. filed June 22, 1926.

1,734,452. PLUNGER LOCK CIRCUIT CONTROLLER; T. G. Stiles, Arlington, N. J. App. filed June 23, 1927.

1,734,456. RECORDING-WEIGHING SCALES SWITCH; A. K. Ygger, New York, N. Y. App. filed April 17, 1928.

1,734,457. DRY BATTERY; M. Zerner, New York, and O. K. Reinhardt, Jamaica, N. Y. App. filed April 10, 1928.

1,734,473. THERMOSTATIC SWITCH; J. J. Compo, Defiance, O. App. filed Feb. 9, 1927.

1,734,505. SUN-BATH CABINET; A. Swanfeldt, Los Angeles, Calif. App. filed April 23, 1927.

1,734,512. AUTOMOBILE TURNING SIGNAL; B. H. Alsop, Tillamook, Ore. App. filed Feb. 8, 1929.

1,734,536. ELECTRIC FURNACE; V. Sorrel and L. A. Lafont, Grenoble, France. App. filed Aug. 4, 1928.

1,734,537. BUS-BAR STRUCTURE; A. G. Steinmayer, Milwaukee, Wis. App. filed April 16, 1925.

1,734,543. OUTLET BOX CONSTRUCTION; G. C. Thomas, Jr., Elizabeth, N. J. App. filed Feb. 24, 1923.

New Trade Literature

HANGERS. — Thompson Electric Company, Cleveland, Ohio, has recently issued catalog B-29 describing the Thompson hanger. In this 30-page booklet, attractively made up with a plentiful supply of illustrations, the subject is discussed at length under such headings as design and construction, operation, installation and wiring, etc.

GRID-GLOW DEMONSTRATION SET.—The "Grid-Glow Demonstration Set" is the title of leaflet 20437, just released by the Westinghouse Electric & Manufacturing Company. This four-page folder describes the novel demonstration set involving the grid-glow tube, which can be used to operate almost any type of display or exhibit that can be conceived. Some of the many applications of this advertising medium are starting electric fans, lighting electric lights, sounding electric bells and turning on radio receiving sets. Illustrations of several of the applications of the grid-glow set are shown in the leaflet, together with a wiring diagram of a typical installation.

ELECTRIC HEATERS.—F. W. Shepler Stove Company, Pittsburgh, Pa., has issued an eight-page catalog on radia electric heaters.

PITTSBURGH TESTING LABORATORY. —A brochure has just been issued by the Pittsburgh Testing Laboratory outlining the professional service and facilities offered by that organization. Under such headings as chemical division, physical testing division, inspection service, etc., the various functions of the laboratory are discussed.

OILING AND FILTERING.—William W. Nugent & Company, Chicago, has issued bulletin No. 15 (edition No. 2), containing 48 pages of text and illustrations on oiling and filtering systems. Numerous diagrams show the outstanding features of the Nugent system of oiling of engines and machinery.

INDUSTRIAL LIGHTING.—British Electrical Development Association, Inc., has issued booklet E.D.A. 804, entitled "Summer-Time Ends," covering the subject of the lighting of industrial establishments. Through illustrations the value and efficiency of modern lighting is demonstrated.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Agency is sought in Buenos Aires, Argentina (No. 42,193), for storage batteries.

Purchase is sought in Maracaibo, Venezuela (No. 42,288), of electric fans.

Agency is sought in Buenos Aires, Argentina (No. 42,244), for floor polishers, paint sprayers and domestic forced-draft fans.

Agency is sought in Berlin, Germany (No. 42,303) for electrical household appliances.

Agency is sought in Sidney, Australia (No. 42,307), for electric lighting fixtures.

Agency is sought in Athens, Greece (No. 42,361), for electric motors.

Agency is sought in Kingston, Canada (No. 42,209), for cooking ranges, electric and coal combined.

Purchase is sought in Maracaibo, Venezuela (No. 42,288), of electric refrigerators.

Agency and purchase are sought in Santa Fe, Argentina (No. 42,290), for electric refrigerators.

Agency and purchase are sought in Amsterdam, Netherlands (No. 42,247), for searchlights for boats.

Agency or purchase is sought in Oslo, Norway (No. 42,252), for electric portable tools.

Agency is sought in Stockholm, Sweden (No. 42,211), for electric clothes and dish washers.

Agency is sought in Berlin, Germany (No. 42,212), for electric welding equipment.

Agency is sought in Wellington, New Zealand (No. 42,210), for bare copper wire.

Agency or purchase is sought in Oslo, Norway (No. 42,252), for wiring supplies.